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ABSTRACT

Trends in the development and utilization of information and communication technologies (ICT) in the 13 candidate countries for admission into the European Union(the CC13) were examined by a 12-member panel of experts and its staff. The analysis focused on the following topics: (1) the communication infrastructure available in the CC13; (2) issues of infrastructure and the services and content provided through communication networks; and (3) the ICT-related capabilities and skills of the workforce in the CC13. The following were among the key issues and challenges identified: (1) the security and trust of customers in the new technological solutions for finance, trade, and communications; (2) the widening digital divide in the CC13 and local industry's ability to implement advanced technologies and supply state-of-the-art equipment and services; (3) the availability of public access points and involvement of all stakeholders in the process of building infostructures and providing high-quality services and content to the general public; (4) the ability of existing training systems to meet the requirements of a knowledge society; and (5) the need to strike a balance between acute societal day-to-day needs and the needs of an information society. (Forty-seven tables/figures/boxes are included. The bibliography lists 98 references. Lists of panel members and acronyms and abbreviations are appended.) (MN)

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Information and Communication Technologies

Enlargement Futures Series 05

**Elissaveta Gourova, Jean-Claude Burgelman,
Marc Bogdanowicz, Christoph Herrmann**

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Introduction & Executive Summary

Over the next ten years the European Union (EU) enlargement process will move beyond its present focus on negotiations for accession with the candidate countries to an increased focus on the challenges and opportunities to be faced by an EU consisting of 25-30 member states.

The 'Futures' project completed in 2000 by the Institute for Prospective Technological Studies (IPTS) outlined some basic issues related to the contemporary development in 13 candidate countries (the CC13) and their impact on Europe. However, this was only a first attempt to sketch the issue in the wider context of the development of the EU.

The need to understand the uncertainties and challenges of the Enlargement process much better was recognised at a High Level meeting in Tallinn (September 2000). As a result, it was decided at a Steering Group meeting in Brussels (February 2001) that a new foresight activity on the techno-economic and social impact of enlargement – the 'Enlargement Futures' project – should be launched, matching both the format of the 'Futures' project and its policy relevance.

The aim of the 'Enlargement Futures' project is to examine the main contemporary technological, economic, political and social drivers in the candidate countries and their possible impact on technology/science, competitiveness and employment in the enlarged Union within a time frame of ten years. In order to achieve its objectives, the Project has involved experts from the CC13[1] and EU countries in an interactive process based on workshops and seminars and supported by background research. Preliminary results were discussed at a seminar in Prague (17-19 September 2001) and the final reports were published for a conference in Bled (2-4 December 2001).

The 'Enlargement Futures' project is structured around four clusters of issues and challenges for the development of the CC13 and their corresponding Thematic Panels:

- Economic transformation
- Technology, knowledge and learning
- Employment and societal change
- Sustainability, environment and natural resources

After the first meetings of the Thematic Panels in May 2001, the IPTS team acknowledged the need for the 'Enlargement Futures' project to outline more explicitly the trends in the development and utilisation of Information and Communication Technologies (ICTs) in candidate countries. This also supports the high priority given to the development of the Information Society (IS) by the governments of the CC13, also reflected in the eEurope+ Action Plan.

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[1] We will further refer to the Candidate Countries as CC13 whenever considering the 13 countries in process of joining the European Union: the 10 Central and Eastern European Countries or CEEC10, also called Transition Countries, together with the three Mediterranean candidates: Turkey, Malta, Cyprus.

The main argument for the importance of the IS for candidate countries is much the same as the argument expressed at EU level. The information (r)evolution has been recognised by European policy makers as a huge economic and social challenge, but also as an opportunity for the creation of wealth, the sharing of knowledge and the tightening of social bonds. Moreover, ICTs are seen as one of the core elements driving Europe to become "the most competitive and dynamic knowledge-based economy". If the CC13 embrace this, it will bring them enormous opportunities and challenges, as it will for the rest of Europe.

Therefore, the CC13 aim to achieve similar objectives to those described in the eEurope Action Plan, albeit on a different schedule.

The Panel on 'Information and Communication Technologies' focused on the development of ICTs in the CC13, their socio-economic impact and the challenges to individuals, companies and the society as a whole.

The present paper reflects the work of the Panel; though it is not intended to be exhaustive. The lack of consistent, comprehensive, comparative and verified data on ICT industries, their developments and impacts in all candidate countries is a generic problem found across all Thematic Panels[2].

Additional research problems are also presented by the great geographical spread and size of the CC13, their different economic situations, culture and historical pathways, the high speed of acquisition of information technologies and the underdeveloped tools for their monitoring at national/regional level. The analysis presented is therefore a best effort, to be deepened by more research in the future.

The paper outlines the status and trends in the CC13 in the three enabling areas or necessary components for building an Information Society: networks (infrastructure), applications (info-structure) and skills (capabilities). On this basis, it attempts to highlight a number of future opportunities and possible barriers for the IS development in candidate countries.

In general, ICTs offer the same opportunities with regard to modernising governance, boosting the economy, revitalising education etc. for the CC13 as they do for the EU15 countries. To some extent it can also be argued that these technologies will help the CC13 to leapfrog the overall economic, social and technological arrears of their societies.

The ICT panel concluded that there is no technical reason why this leapfrogging would not be possible as it was observed that the main (huge) obstacles are in the financial, regulatory and policy realms, rather than purely technical. And even though the right political context is created in the CC13, the question remains whether the necessary funds will be available to avoid the multiple digital divides in these societies.

The digital divide the CC13 are facing is indeed multiple and thus more complex than in present EU member states. Not only is there a divide between urban and rural, rich and poor, old and young, there is also one between small and large cities and amongst enterprises. Moreover, the development of new technologies varies considerably between the candidate countries themselves – some reaching the EU average level and others lagging far behind even the least advanced member states. As in the rest of Europe, the different pace of economic growth and the policy of national governments in the ICT sector have introduced large differences in telecommunication penetration and the availability of advanced services to the general public and businesses.

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[2] In academic research also the issue of ICT & PAC is only very recently being addressed, (e g G Banse, 2000)

Addressing the multiple dimensions of the digital divide in the CC13 will therefore require a large-scale plan and a big policy push.

As well as sufficient financial resources being available, this plan will require the respective environment to speed-up the practical implementation. Although various initiatives have been launched in the framework of the EU/CEEC dialogue on the Information Society[3], practical results are still insufficient. Prioritising the roll-out of an IS, as is suggested by the adherence of the CC13 to the principles of eEurope in the recently launched eEurope+ Action Plan, can accelerate a larger movement to profoundly change regulatory regimes, to modernise (public) administrations and public services, to rethink education, etc.

If the will is there to start this process, how will this be affected by the very serious and complex overall challenges the CC13 face to transform their economies and societies? In this respect it is encouraging that the panel found real opportunities for the CC13 to develop a strong ICT industry in two directions:

i) Some parts of their ICT industry, like software, can clearly be competitive on a global scale. Some of the CC13 are already strong players on a world scale. As the software industry is mainly 'brain' driven, future potential looks promising.

ii) Their ICT industry has to come up with local solutions to specific local needs as regards technology, content and so on. This might be the basis for the build up of a strong domestic economy with an inter-regional and even international outlook (exporting local solutions to similar developing economies beyond the EU+ borders).

All this points to the most important conclusion of this report. There is no doubt that ICTs will find their own way in these societies, but the CC13 will probably only develop pockets or islands of an IS. Certain regions, in certain countries, principally in certain parts of the overall economic activity, will have access to and use ICTs, thereby gaining long term benefits. Most regions and societal sectors, however, will be left out unless they are heavily supported by policy. Only a multi-layered policy push will ensure that the CC13 build up their own socially inclusive and competitive knowledge-based society. eEurope+ is therefore the needed and necessary but first step.

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[3] EU/CEEC Joint high-level committee (2000)

The report has been organised in 3 parts with a conclusion summarising the most important challenges and threats on the way towards an IS in the CC13.

The **first part** focuses on the communication **infrastructure** available in these countries – physical and logical networks and systems for provision of voice, data and images. At the centre of the debate is the availability of modern communication networks and advanced information technologies (IT) and the involvement of industry. Important issues for the future are the security and trust of customers in the new technological solutions for finance, trade and communications. Competition rules and governance of the converging media will also call for special policy consideration. Particular attention has been paid to the widening digital divide in the CC13 and the ability of local industry to implement advanced technologies and supply state-of-the-art equipment and services, meeting the requirements for interoperability and user friendliness.

The **second part**, dealing with issues of **info-structure** and **content**, outlines the recent development towards provision of new services and content through communication networks. An important aspect is the availability of public access points and the involvement of all stakeholders in the process of building info-structures and provision of high-quality services and content to the general public. The first steps in building a knowledge economy also require appropriate actions, both by industry and state bodies. Equally, the preservation of human rights and democratic values calls for appropriate actions by all stakeholders.

The **third part**, **capabilities and skills**, addresses the critical issue of the competency of the population, in particular the workforce. Digital literacy, awareness of the implications of ICTs and their benefits are necessary conditions for the development and use of new electronic services for entertainment, business and work. New managers need new skills and knowledge of the available tools for better management and communication with customers and partners. However, whether the education and training systems meet the requirements of the knowledge society remains an open question.

The **fourth part** summarises the **most important challenges** for EU and national policy with regard to the building up of a competitive (ICT) economy, the outlook for employment and skills, their potential impact on governance and the complex nature of the digital divide in the CC13.

Finally it should be stressed that the challenges and opportunities described above have to be seen against the background of the overall challenges for the development of the CC13. They face enormous problems in their transition to modern economies and societies. Their policy makers will be under huge pressure to respond to the legitimate short term needs and problems of their population rather than the more long term problems of the roll out of an IS.

Striking a balance between these two sets of policy objects (acute societal day-to-day needs and IS needs) is probably the most difficult policy challenge in that respect.

Chapter 1
Infrastructures

The pace of building an Information Society in the CC13 will be strongly dependent on the availability and affordability of ICTs to individuals, organisations and the society as a whole, as it is elsewhere in the world. A basic requirement is to develop a modern digital communication infrastructure with high transmission capacity, capable of ensuring local and international broadband connectivity and to provide opportunities for private companies, public institutions and individuals to access the available electronic services and on-line information. Furthermore, the quality and security of the established links must be high to meet consumer demands and to ensure trust and confidence in the new digital environment.

This chapter outlines the trends in the development of telecommunications and information technologies in candidate countries. It highlights the challenges to all stakeholders to ensure a strong growth of the ICT sector and the competitiveness of the industry.

1.1 The Communication networks

Telecommunications development in Central and Eastern European countries (CEEC10) in the last decade has been characterised by radical reform on three major fronts– changes in institutions, market structures and regulatory rules. The process of reform involved the separation of telecommunications and postal management, the separation of operational, regulatory and policy functions, the establishment of a new regulatory framework to allow the introduction of competition and the separation of state ownership functions from policy making.

The transition from state monopoly to operation under market conditions in a very short time has posed enormous challenges for CEEC10. Comprehensive reforms have been carried out at the same time, when transition from a centrally planned to a market-based economy was taking place, along with changes in state institutions, governing principles and safety nets. Moreover, the lack of experience and practice, the lack of financial resources and last, but not least, the relatively outdated telecommunications infrastructure have made the whole process more difficult than the respective reforms in Western Europe.

The Mediterranean countries followed quite a different development path as in countries like Cyprus and Malta, infrastructure developments were already comparable to those in the EU 15. Despite the differences of their initial status, all CC13 are at present continuing to introduce changes in the ICT sector in line with accession requirements and in particular the 'acquis communautaire'.

Diversity of networks

The efforts made by governments in CEEC10 and the large support by international organisations and financial institutions have led to modernisation and expansion of the telecommunications networks and growth in the whole sector, despite all the on-going painful transformations. The process of liberalisation and the opening of the telecommunication market to competition facilitated the introduction of advanced communication technologies and the development of a wide diversity of communication networks and services in all candidate countries. At present a number of public or closed user-group networks, with national or regional coverage, provide access to voice, data and images via satellite, cable or wireless facilities. Consumers in candidate countries have various opportunities for communications, work or entertainment, using mobile, data, paging, VSAT[4].

At the beginning of the telecommunication reforms, all CEEC10 were characterised by outdated analogue telephone networks with low penetration in the range of 9 (in Poland and Hungary) up to 26 (in Bulgaria) mainlines per 100 inhabitants. In only 10 years they have succeeded in building digital backbones in their territory, reaching 100% international and transit digital switching, and in some countries high numbers of lines switched to digital exchanges and high telephone penetration growth were reached[5]. In comparison, the Mediterranean countries Cyprus and Malta were quite advanced in developing digital networks and today they have more than 50 mainlines per 100 inhabitants. Turkey lagged behind in telecommunications till 1980[6], when a rapid advance and expansion of the sector started, aiming at development of a variety of networks and services by using advanced digital technologies to meet the demands of industry and defence. The tables below give account of a certain number of telecommunication and Internet indicators for all CC13.

The advance in telecommunication networks is twofold, on the one hand related to the introduction of modern network management and transmission technologies (e.g. ATM, frame relay, SDH, xDSL, etc.), and on the other – the expansion of connectivity at local, national, regional and pan-European level. This has been facilitated by the collaboration of the CC13 in a number of common infrastructure projects for connecting their national backbones to high transmission international highways through terrestrial or sub-marine fibre optics or satellite lines[7].

[4] Very Small Aperture Terminal, an earthbound station used in satellite communications of data, voice and video signals (excluding broadcast television, radio and television networks)

[5] Over 70% in the Czech Republic, Hungary and Slovenia

[6] With only 2.5 lines per 100 inhabitants in 1980, Wolcott (1999)

[7] Trans-European Line (TEL), Trans-Balkan Line (TBL), BSFOCS (Black Sea Fibre Optics Cable System), FLAG (Fibre Link Around the Globe), etc

Table 1: Main telecommunications indicators

	Total lines per 100 inh.		mobile lines per 100 inh. (1)		share (%) of mobile subscription		level (%) of network digitisation		PC's per 100 inh. (1)		Share of PC's (%) in households (1)	TV sets per 100 inh.		cable TV users per 100 inh.
	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	1999	2000	1999
Bulgaria	38.9	44.3	4.3	8.2	10.4	18.5	78	80	2.7	4.4	7	37.2	37	6.9
Cyprus	62.99	64.72	22.5	26.2	24.7	34	100	100	16.7	28	48	27.5	28	6.1
Czech Republic	57.1	77.6	19.0	29.2	33.6	50.2	72	83	10.7	13.1	24	36.6	44	8
Estonia	64.1	n.a.	26.8	32.0	41.8	52.0	47	67	13.5	n.a.	61	37.3	36	8
Hungary	51.7	60.8	16.2	29.7	30.3	42.2	75	79	7.4	n.a.	30	50.3	n.a.	14
Latvia	42.6	46.9	11.2	15.6	27.8	34.0	40	43	8.2	n.a.	14	39.4	39	5
Lithuania	39.4	43.0	9.0	11.4	20.6	24.9	30	33	5.9	n.a.	32	55.4	73	7
Malta	52.04	52.76	9.7	21.1	14.2	18	100	100	18.1	21.0		66	n.a.	13.7
Poland	36.9	44.5	10.2	15.0	28.6	34.9	97	97	6.2	15.5	23	23.9	24	8
Romania	23.5	32.3	6.2	12.6	25.6	38.7	55	50	2.7	3.2	32	19.1	20	16
Slovakia	47.9	52.9	17.0	21.5	35.5	40.6	n.a.	67	7.4	n.a.	25		23	
Slovenia	76.1	104.7	31.5	57.4	43.7	54.7	93	100	25.3	27.3	54	38.0	41	13
Turkey	30.74	31.37	12.5	19.3	23.5	38	83.81	85	3.2	4.6	n.a.	33.02	33	1.17
Finland	130	n.a.	66.8	72.8	50	n.a.	n.a.	n.a.	36	n.a.	53	40.7	n.a.	17.8
Greece	92	n.a.	31.4	55.7	40	n.a.	n.a.	n.a.	6	n.a.	19	31.3	n.a.	3

Source: ESIS 2001, (1)Eurostat (2001)

Table 2 Internet indicators

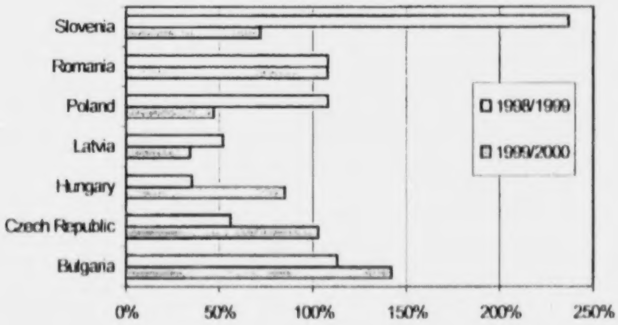
	total number of hosts			hosts per 10000 inhab.			estimated users per 10000 inhab.			users (in 1000)	
	1996 (1)	1998	2000	1996(2)	1998	2000	1996	1998	2000	1998	2000
Bulgaria	3017	10250	18429	3.92	12.30	22.41	70.85	179.94	283.36	150	386.4(3)
Cyprus	n.a.	5491	7998	n.a.	73.92	117.62	n.a.	403.88	1764.71	30	120
Czech Republic	3775	86482	159319	39.60	84.11	155.52	193.89	389.03	976.18	400	1000
Estonia	5612	24158	40909	54.29	166.64	284.25	n.a.	1034.69	2547.25	150	366.6
Hungary	30486	95931	104415	29.22	94.12	102.09	97.92	392.46	699.06	400	715
Latvia	5423	14332	19925	23.31	58.30	83.72	161.29	325.41	630.28	80	150
Lithuania	1697	9802	17804	4.67	26.46	48.14	26.97	188.99	278.45	70	103
Malta	n.a.	1838	6597	n.a.	47.86	169.59	n.a.	234.38	1028.28	9	40
Poland	49600	130554	339816	13.68	33.72	87.66	124.23	408.34	722.3	1581	2800
Romania	5261	23508	41523	3.46	10.46	18.60	22.12	222.48	358.31	500	800
Slovakia	7197	22064	37921	14.77	41.03	70.16	186.08	929.89	1202.59	500	650
Slovenia	25126	22932	21868	69.35	115.06	110.11	502.26	1003.51	1257.02	200	250
Turkey	n.a.	48873	69923	n.a.	7.32	10.64	n.a.	67.43	304.41	450	2000
Finland	n.a.	459568	529261	n.a.	890.64	1022.53	n.a.	2540.70	3722.95	1311	1927
Greece	n.a.	49904	110608	n.a.	47.08	103.91	n.a.	330.19	939.41	350	1000
US	n.a.	30489463	80566947	n.a.	1120.69	2928.32	n.a.	2205.4	3465.78	60000	95354

Source: ITU Internet indicators 1998, 2000
(1) Ripe NCC Hostcounts, 1996, 1998
(2) World Communication and Information Report 1999-2000
(3) Bulgarian State Commission on Telecommunication, Annual report 2000

ESIS report of 2001 highlights the high growth of mobile phone lines in CEEC10 – the mobile share of the total telephone lines increased from 5% to 38% between 1996 and 1999. Most candidate countries have very high geographic and almost full population coverage by mobile networks. Estonia and Slovenia, for example, reached the EU15 level of mobile usage. Some candidate countries had very high growth of mobile lines (see Figure 1, below). It should be noted, however, that the pace of growth is slowing down in some countries like Poland and Slovenia, while in Bulgaria, Hungary and the Czech Republic the growth rate is still increasing. Alongside traditional mobile telephony, advanced mobile services are starting to emerge in many countries (e.g. the Czech Republic, Estonia, Hungary, Latvia, etc.) with the introduction of advanced technologies like WAP (Wireless Application Protocol), GPS (Global Positioning Service), GPRS (General Packet Radio Service), HSCSD (High Speed High Circuit Switched Data). However, the high price and limited availability of mobile phones supporting some of these technologies, e.g. WAP, limit the number of users[8].

Along with mobile and fixed telephony, cable TV networks have experienced significant development in the last decade. Cable TV is quite well developed in most of the CC13, due to the early liberalisation of this sector and to the availability of TV sets in almost every household. According to the ESIS 2001 reports, more than 50% of all households with TV in Slovakia, Romania and Malta have cable TV, whereas in most other candidate countries around 20% have cable TV (e.g. Czech Republic, Slovenia, Estonia, Cyprus). The availability of alternative networks becomes an essential opportunity for the provision of low cost information and communication services to end-users. First attempts at the provision of Internet access via cable TV networks have already been made in Bulgaria, the Czech Republic, Latvia, etc. In Hungary, for example, Internet access via cable modems is attractive to end-users. UPC, one of the main European players on the cable TV market, has provided IP services over its networks since 1999. The monthly prices of its most popular packages ('Privat' at 24.58$ and 'Profil' at 31.60$) are comparable to the dial-up Internet access charges of other operators[9].

Figure 1: Growth rates of mobile lines in selected CC13



Source: ESIS (2000), adapted

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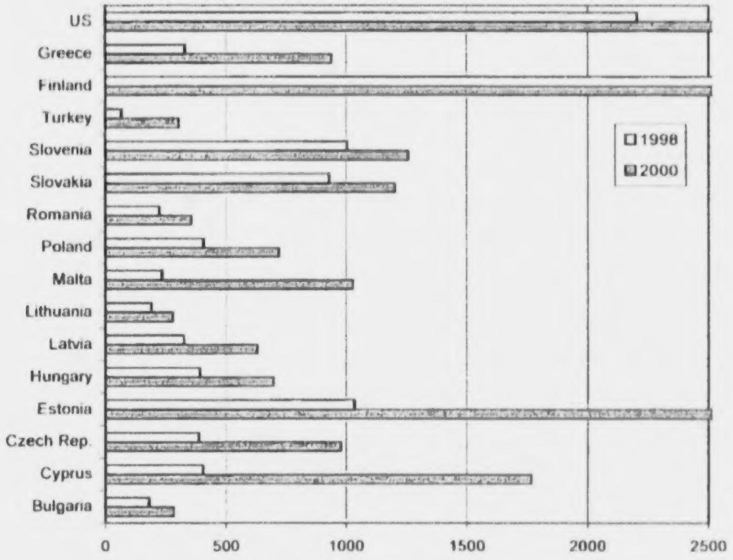
[8] CEEBIC, http //www.mac.doc.gov/eebic/ceebic.html
[9] ITU(2001), p.29

Internet development

Internet development in the CC13, facilitated by the liberalisation of communication services, requires particular attention. There are various means of Internet access – i.e. over the fixed, mobile or cable TV network. Dial-up and ISDN access (where available) are most widely used by individuals and small and medium-sized enterprises (SMEs). Large business users often build their internal LAN (local area network) connected to the public network via leased lines, or even build their own VSAT network. Nation-wide dial-up numbers are available in many countries, facilitating especially access through reduced prices for the telephone traffic. In Bulgaria, for example, pre-paid cards are also widely used (by more than 15% of home users)[10]. DSL, cable TV, satellite Internet access and other advanced technologies for provision of service to end-users are in an early phase of deployment.

Figure 2: Estimated Internet users per 10000 inh.



Source: ITU Telecommunication indicators, adapted

One barrier for Internet development is the insufficient development of local infrastructure and international connectivity, e.g. the low digitisation at local level and low use of ISDN services[11]. At the end of 2000, for example, only Estonia, Slovenia, Cyprus and the Czech Republic had ISDN penetration higher than 1%. Most users access Internet via dial-up connections with poor quality. The low teledensity and long waiting lists in some of the CC13 (e.g. more than 3% of the population in Poland, Romania, Bulgaria and Turkey) also hamper Internet penetration and impose serious threats for growing regional disparities in provision of access to new communication networks and services.

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[10] State commission for telecommunications, Bulgaria (2000)

[11] ESIS(2001a,b), Cullen International (2001)

Internet growth rate is also estimated according to Internet hosts. In 2000, strong growth of Internet hosts in candidate countries was noticed – for 10 months 55% growth on average, compared to 38% in EU15 for the same period and 58.7% growth in Japan for 6 months[12].

Despite this important rate of Internet growth in the last few years, the CC13 on average still lag behind Member States in all measures of Internet access and usage (Table 2). There is a big difference between candidate countries: Cyprus, Estonia, Malta, Slovenia and Slovakia have higher Internet penetration than some EU member states (Figure 2), while Poland and Turkey have a large market, where the total number of Internet users represents more than 50% of all users in candidate countries. At the same time, there are large differences between the users in the countries, based on location, income or age (see Box 1).

Box 1: Access and usage of Internet and PCs in some CC13

A household survey in *Hungary*[13] highlights that Internet use is much higher in households with youths aged 15-29, in higher-income families (91% of all households by 58% country average) and leaving in the capital (46% of all households by 20% country average). Internet usage is dominated by educational institutions (44%), while corporate and government users are 29% and users at home and in small offices reach 27%. According to the access methods – 97.6% have dial-up connection, while 1.2% ISDN, 0.8% use leased lines and 0.4% cable TV.

Turkey[14] shows an uneven distribution of communication technologies and services among its population. Large differences exist within social groups, whereas nearly 77% of all computers are owned by 40% of all households belonging to the highest socio-economic status groups. The low economic status group with around 40% of the households owns only 10% of all computers.

In *Estonia*,[15] the biggest group of Internet users covers the 19-29 years age group (58%), though one of the fastest growing groups is that of the 40-49 years old people (14% of the Internet users), while only 7% of the users are between 50-74 years old. Internet usage is higher in the male population (64%) and by people leaving in the big towns (66%). According to the educational level – 44% of the users have secondary and 40% higher education. It is interesting to note that the main reason to use Internet, according to more than 50% of the Estonians, is to look for a specific information, find information for work or read on-line publications, while around 20% of the users are looking for school information or doing banking operations on-line.

The high speed of technology adoption and introduction of changes to the telecommunications market raises some expectations that candidate countries will be able to catch up in technological terms in short period of time. However, we should not underestimate the fact that the overall economic situation in these countries is widening the gap between the people who can use advanced technologies and services and those for whom they are a luxury. As progress in ICTs is determined to a large extent by the level of economic development and the purchasing power of the population, the countries with low per capita GDP are not capable of sustaining a high rate of ICT growth and high teledensity (Figure 3).

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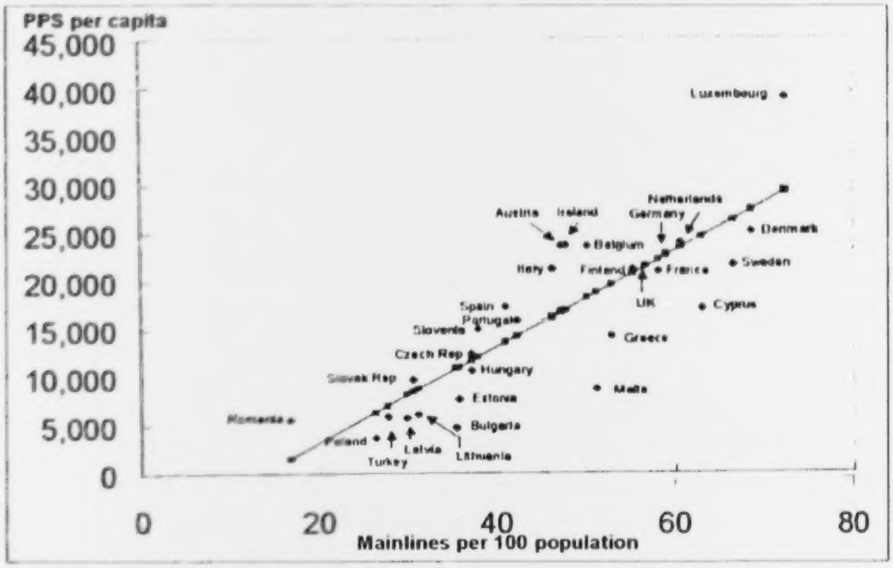
[12] Eurostat (2001c,d)
[13] ITU (2001)
[14] TUENA (1999), p. 7
[15] Surveys carried out by Baltic Media Facts Ltd. see http://www.bmf.ee

Figure 3: Mainlines per 100 inhabitants regressed on GDP per capita



Source: Cullen International, 2001

The complex and expensive cost structures of telecommunications services impose additional barriers for the penetration of Internet-based services and the expansion of the sector. The monthly Internet access charge in many candidate countries comprises service provider and telephone call charges and reaches 44$ in the Czech Republic, 34$ in Poland and Turkey; much higher than equivalent charges in the US (20$) and Canada (12$). It is comparable, however, to Germany (51$), France (43$), Spain (39$)[16]. Thus, high monthly charges place the Internet out of reach for many people in the CC13, in particular residential users. Moreover, the low purchasing power of the population is an obstacle for achieving a critical mass of users for the development of a digital economy. The number of Internet users per 100 inhabitants is still only 1/3 of the EU average and the share of home Internet users from the total number of users is even lower – less than 30% in most CC13, except in Estonia and Lithuania where it is higher than 60%[17].

A possible solution to the high costs of Internet access is the flexible tariff schemes introduced by many Internet service providers (ISPs), where users can choose between full monthly access with non-guaranteed quality, limited access over pre-defined time-zones, free-of-charge night access or at preferential prices, etc. Even during off-peak time some CC13, for example Hungary and Poland, have very high Internet access charges - highest among OECD countries, while Turkey has the lowest levels (see Figure 4). The incumbent monopoly is considered to be one of the reasons for high Internet prices. It is expected, however, that full liberalisation of the telecommunications market will bring significant changes in the provision of leased lines and access at local level, resulting in a fall in Internet charges. As far as access is concerned, the universal service policy is seen as a means of achieving more balanced development in infrastructure and of allowing participation of many disadvantaged groups.

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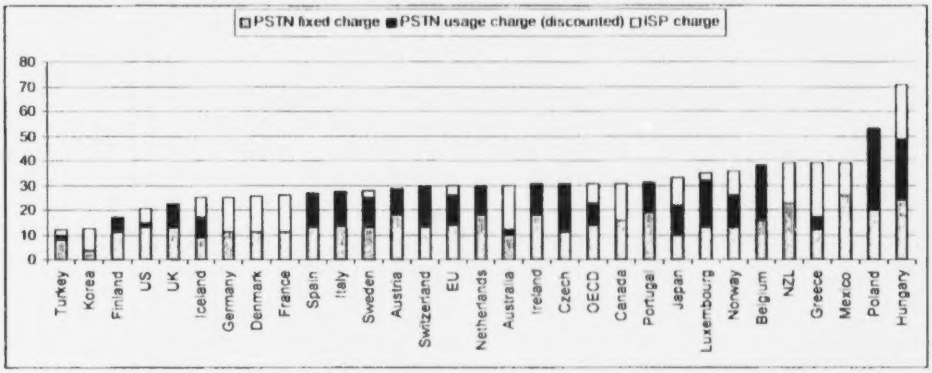
[16] World development indicators 2001
[17] Eurostat (2001a,d)

Figure 4: OECD Internet access basket (20 hours at off-peak times, 2001, in US$)



Note: PSTN fixed charges include monthly rental fee. The basket includes 20 one-hour calls. Off peak is taken at 20h00. In some countries, ISP and PSTN usage charges are bundled and included under either the ISP or the PSTN charge.

Source: OECD, http://www.oecd.org

Public access points like Internet cafés, telecenters, community centres, etc are popular means of access to electronic services, in particular the Internet. They are also supported by a number of international and non-governmental organisations (NGOs)[18]. Usually, such centres are set up at post offices, banks, big commercial centres, hotels, libraries, etc. Apart from the traditional ISP Internet clubs, various forms of provision of Internet access and electronic services at public places can be found in the CC13 - for example, in post offices and telecottages in Hungary[19], in 'chitalista'[20] (old form of public cultural-information centres) and telecentres in Bulgaria, and in community centres in Malta and Estonia, etc.

Research and administrative networks

The high growth rate of specialised networks for researchers and for interchange of data between administrations also requires attention. Administrative networks, which started as local area networks in particular ministries, already connect central governmental bodies in candidate countries, and many regional branches and local authorities using state-of-the-art technologies. Similarly, the establishment of independent national academic backbones has followed a top-down scheme – starting from cities and big academic institutions and reaching down to smaller towns, research units or schools. Due to the collaboration of state bodies, private companies and NGOs and the international collaboration within pan-European projects (e.g. DANTE, QUANTUM, GEANT) it has been possible to provide higher bandwidth for researchers and Internet access for a number of schools in the CC13.

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[18] Council of Europe (1999), ITU-D Study Group (1999a); Gourova et al. (2001a)
[19] G.Bihary et al. (1999)
[20] UNDP (2000)

Box 2: Administrative and academic networks in some CEEC [21]

A high-speed *administrative network*, based on ATM technologies has been established in *Bulgaria*. Institutional LANs and interdepartmental virtual networks have been built within the network. In the year 2000 the network included 90 computer networks in ministries and state administration bodies. Further development of the network in the regional centres. as well as the establishment of a national ATM backbone is planned. A project for building a VSAT system has started in order to ensure connection between the state bodies. customs. municipalities, tax services. ministries and their affiliates.

The ***Czech education and scientific network*** evolved from an academic network into an open (commercial) network. expanding geographically and enhancing its bandwidth capacity. Since 1998 ongoing upgrades of the internal network have been carried on to 155 Mbps lines with ATM technology. At present the Czech Republic has a highly integrated national network with an especially high-speed corridor between Prague and Brno.

The ***Hungarian academic and research computer network*** connects the country's 25 regions to Budapest. via fibre optic ATM network. which is then connected to the European TEN-34 project. ***Poland's research and academic computer network*** consists of a country-wide WAN, made up of 43 nodes across the country. connected to a 34 Mbps network via Frame Relay and ATM technologies. There are also several regional academic high-speed networks.

Lithuanian academic and research computer network LITNET connects country's universities and colleges, research institutes. libraries and schools. It has a 155 Mbps backbone between Vilnius and Kaunas and a network of nodes in 8 regional towns connected via Frame Relay technology. International connection now at 45 Mbps is planned to reach 155 Mbps in 2003 according to LITNET GEANT project.[22]

Financial infrastructures and secure communications

Banks were among the first users of electronic data interchange (EDI) services in the CEEC10 and have built their own closed networks to facilitate bank transactions. Despite the rapid development of financial services in the CEEC10, their availability and limited use (particularly of credit and debit cards) by the population in many countries, pose serious problems for the development of e-commerce. The high level of fraud and the lack of risk management skills in CEEC10 are considered to be major reasons for the underdevelopment of these payment solutions.

Payment cards

Payment cards are considered central to the development of a more efficient banking sector and the networked economy in general. As with other sectors of the economy, the financial services sector follows a different pace in each of the CC13. Countries like Turkey, Malta and Cyprus have long traditions in banking and financial sectors and well developed credit card systems. In particular Turkey has a very large number of card users (more than 20 millions) and very good coverage by ATM terminals. In the CEEC10, recent changes in ownership of many banks, now owned by foreign investors, have facilitated the development of card services, increasing the financial stability and quality of management.

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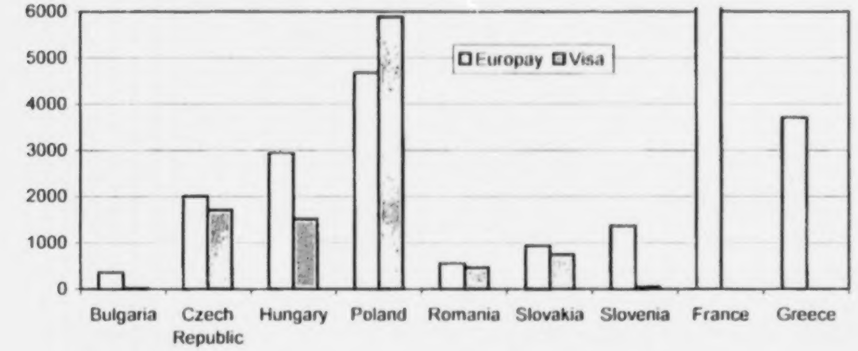
[21] EU/CEEC Joint High Level Committee (2000), UN Economic Commission for Europe (2000), http://www.litnet.lt

[22] Input has been provided by Dr. Antanas Cenys, Chairman of the Senate of Semiconductors and Physics Institute, Lithuania

In 2000, card numbers in Eastern Europe grew by 30%, reaching 31.3 million at the end of the year[23]. But despite this recent growth in the number of credit cards, their deployment is still low – due to the insufficient merchant acceptance of cards and the low number of payment cards issued (Figure 5). In March 2001, Slovenia, Estonia, the Czech Republic, Poland and Hungary reached more than 40% card penetration, but countries like Bulgaria, Romania, Lithuania are lagging behind. Furthermore, in CEEC10, card users are often concentrated in big cities, mainly the capitals, as well as some resort areas, like Balaton in Hungary, Tatra in Slovakia, etc. It should also be noted that credit cards are in their infancy and debit cards represent 88% of all cards in candidate countries. In Baltic countries, for example, merchants' acceptance of credit cards is 8-10 times less than in Nordic countries[24].

Figure 5: Number of payment cards in selected countries - 2000 (in 1000)



Source: Welch (2001), adapted

Security of communications

The development of e-commerce is highly dependent on the deployment of on-line payment systems and security enhancing technologies. Few banks offer payment solutions (see Box 3), but the norm is to order on-line and to pay on delivery. In Hungary despite the scepticism of the customers for on-line payment banks are offering on-line banking services, mainly account information. Some are going further providing on-line opportunity for card control, purchasing investment funds, making deposits or transferring funds, etc.[25] A full system for e-payments using Internet banking cards has been launched in Bulgaria. The system ePay.bg allows credit and debit cards owners to pay for services and purchases on the Internet. With the launch of the provision of digital certificates by the Bulgarian Industrial Association and the entry into force of the Law on electronic document and electronic signature (2001), e-commerce is expected to grow[26].

Many private actors in CEEC10 believe that the present lack of Internet access and credit cards, along with the high degree of mistrust, could be overcome by new technological solutions like WAP. This technology could circumvent the main barriers to the Internet and give mobile users access to travel information and bank accounts, brokerages, on-line shops, etc. The fact that countries like Hungary, the Czech Republic and Poland are already launching WAP services is therefore encouraging.[27]

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[23] Peter Welch, The POS challenge, European Card Review, July/August 2001

[24] Europay International, http://www.europay.com/corporate/Corporate_key_figures_page.html

[25] ITU (2001), p.44

[26] http://www.ePay.bg and http://www.bia.bg

Box 3: E-payment in Lithuania[28]

In Lithuania the Hansa-LTB bank introduced on-line banking opportunities, similar to the services provided in Latvia and Estonia. It is the first solution in Lithuania enabling customers to use Internet to pay for the goods and services on-line without payment cards. The opportunities are provided by the Bank Link system developed by Hansa-LTB. The payment takes place in the 'hanza.net' environment and requires no payment related data input at the e-shop site. Mobile communications company Omnitel is the first company that employed this system and enabled its clients to credit their EXTRA cards via the Internet.

Other Lithuanian e-shops are expected to make use of the opportunities offered by the Bank Link in the nearest future. According to Hansa-LTB the e-shops that wanted to have their payments automated had only one solution to use payment cards. However, this particular method of payment is not widespread in Lithuania. Customers show no confidence in it as the seller obtains all the information on the customer's payment card. Meanwhile, Bank Link guarantees safety of the customer's account, because all operations take place at 'hanza.net' instead of an e-shop.

(Dr. Antanas Cenys, Chairman of the Senate of Semiconductors and Physics Institute, Lithuania)

Box 4: Internet security – the Hungarian case

Authentication: In Hungary 95% of authentication is based on a password. The rest of the market uses token card solutions such as Secure ID, Crypto Card. The use of smart cards in authentication is still in the initial phase. There are some efforts to introduce finger print recognition in authentication by Guardware Systems Ltd., founded in 1999 in Budapest by an international group of investors. Biometric security from Guardware Systems is based on advanced fingerprint recognition algorithms ensuring high and reliable performance, and on a durable optical scanner equipped with a unique biosensor.

Authorisation: The access to IT system resource, any right to use it or modify it, is managed using Windows NT4, Windows 2000, UNIX and Trusted Solaris. In case of database management systems are used the solutions of Oracle, Informix, Sybase and SQL Server. Cisco also has a dominant market share supporting the authentication, authorisation and accounting (AAA) protocols TACACS and Radius. These solutions are mostly used by ISPs, telecommunications companies and banks.

Public Key Infrastructure (PKI): Netlock Co.Ltd. is the first and only one public Hungarian certification authority with two main activities: issuing digital certificates and PKI integration. Its Certification Practice Statement (CPS) is accepted by the Hungarian Chamber of Public Notaries and already conforms to the future Hungarian Digital Signature Law expected to be passed soon by the Parliament.

(CEEBICnet (2001), http://www.mac.doc.gov/eebic/countryr/hungary/market1.htm)

The CC13 are trying to follow the new technological solutions for reliable and secure systems. According Netcraft survey[29], from March to December 1999 the number of secure servers in many candidate countries (e.g. Poland, Slovenia, Hungary, Estonia, etc.) increased by more than 50%, while in the Czech Republic they almost doubled. In general, all existing Internet security technologies such as authentication, authorisation, firewalls for secure transactions and Virtual private networks, encryption, anti-virus screening and enterprise security solutions are known and used in candidate countries (see Box 4). However, their penetration has still not reached a critical mass. In comparison to the other OECD countries, Turkey, Poland and Hungary are lagging behind with very small number of secure servers per million inhabitants[30].

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[27] Eade Ph. et al. (2000)

[28] http://www.omnitel.lt

[29] quoted in UN Economic Commission for Europe (2000), p.76-78

The first attempts at digital signature acceptance and use have been already made in many candidate countries, facilitated in particular by the establishment of digital signature legislation. In 2000, laws on digital signature or electronic documents were adopted in Bulgaria, the Czech Republic, Estonia, Lithuania and Slovenia, and in many other countries they have been discussed or drafted[31]. Although some candidate countries have adopted new regulations against various forms of cybercrime (see Table 3), a secure communications environment is still lacking. The awareness of Internet security threats is not wide spread, except in banking, telecommunications, government, IT sectors and oil and gas industry. Generally, small and medium-sized enterprises try to solve security issues in-house without using professional service companies specialised in security solutions.[32] Practical enforcement mechanisms are still undeveloped and the law enforcement authorities in particular lack training and experience, as they do in many other countries.

Information technologies

A highly developed IT market might facilitate the use of computer networks and meet the demands of individual and corporate customers. Of particular importance are the prices of equipment and software and the availability of market structures appropriate for the needs of small and large customers. The development of the IT market is facilitated by the regulatory environment, in particular governmental procurement and the Information Society policy, with a corresponding growth of demand by public institutions, enterprises and individuals. The liberalisation and the lack of barriers (e.g. customs duties or any restrictions) for import of computers, peripherals and terminal equipment further contribute to market growth. Hungary, a non-member of the TRIPS (Trade-related aspects of the Intellectual Property Rights) agreement, is one of the few exceptions and imposes import taxes on computers outside the EU countries.

Despite legislation to protect intellectual property rights (IPRs), Eastern Europe is considered as a region having the highest piracy rate.[33] In most candidate countries piracy software rates have essentially decreased since 1995, but are still higher than 50% (lower in the Czech Republic and Slovakia). Piracy not only incurs losses for foreign computer and software companies but also has negative implications for domestic firms, reducing their opportunities for growth and imposing barriers to innovations. In Latvia, for example, the lack of appropriate protection of intellectual property is seen as a drawback for the domestic software and audio-visual industry.[34] The low income of the population again is regarded as one of the reasons behind the illegal software in these countries, along with the low level of awareness.

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[30] OECD (2001e)
[31] ESIS (2000a)
[32] CEEBIC, Internet security reports
[33] Business software alliance (2001)
[34] UNDP (1999)

Table 3: Countries with updated laws related to cybercrime

Country	data crimes			network crimes		access crimes		related crimes		
	data interception	data modification	data theft	network interference	network sabotage	unauthorised access	virus dissemination	aiding and abetting cyber crimes	computer-related forgery	computer-related fraud
Czech Republic		✓	✓		✓	✓				✓
Estonia		✓	✓	✓	✓	✓	✓	✓		✓
Poland		✓	✓	✓				✓		
Turkey		✓	✓	✓	✓		✓	✓	✓	✓

Source: McConnell International (2000)

Table 4: IT hardware sales in 1998 (in units)

	Western Europe	Eastern Europe
Unix servers	129.316	7.641
NT servers	272.100	19.812
Other servers	369.251	67.431
Workstations	210.077	6.040
PCs	19.824.095	2.414.300
LAN cards	15.388.400	1.130.112

Source: EITO 1998

Table 5: IT market value (millions of euros) in selected CEEC10 (1999 estimated)

	Czech Rep.		Hungary		Poland		Slovakia	
	1998	1999	1998	1999	1998	1999	1998	1999
Servers	136	147	89	107	159	178	51	57
Workstations	15	16	10	11	17	17	5	6
PCs	328	359	153	160	525	577	132	153
PC/workstation	116	127	85	97	153	166	40	46
Computer hardware	595	650	337	376	853	939	228	262
LAN hardware	75	86	32	37	87	100	29	34
Other data communications	17	18	15	16	26	28	3	3
Data communications hardware	92	104	47	52	113	128	32	37
IT hardware	765	838	441	489	1.057	1.188	290	331
Systems software	74	81	50	55	74	84	25	27
Application software	77	84	62	67	102	112	23	25
Software products	151	164	112	122	176	195	48	53
Consulting	91	98	59	63	49	59	8	10
Implementation	193	227	118	136	200	230	33	39
Operations management	77	90	40	45	40	45	8	9
Support services	101	112	63	67	94	100	13	15
Services	462	526	280	312	382	435	63	73
Software and services	613	691	392	433	558	630	110	126
Total IT market	1.377	1.529	832	923	1.633	1.818	400	457

Source: EITO, 1998

The IT hardware market in CEEC10 has grown remarkably over the past few years although expenditure still remains much lower than in Western Europe (Table 4). Along with the overall growth in the use of PCs, sales of office equipment and LAN hardware have also experienced considerable growth (Table 5). According to Eurostat data[35], the size of the IT hardware market in 2000 in candidate countries was about 5 billion Euro (Poland and Turkey taking more than 60% of the whole market), compared to 235 billion Euro for EU15. It should be noted, however, that as a percentage of GDP, the ICT expenditure in Hungary (6.42%), Slovakia (5.98%) and the Czech Republic (8.49%) is higher than in Germany (5.27%) and Finland (5.88%), while in Romania (1.78%), Bulgaria (1.76%) and Turkey (2.47%) it is still very low.[36]

Software services represent one of the fastest growing sectors of the IT market in the CC13 and one of the few industries which did not report net losses over the whole transitional period.[37] Particularly strong growth is seen in the market for packaged software, such as PC applications software, enterprise resource planning applications and application tools for database development and management. A remarkable development in IT consulting, contract programming and software design has also been observed. Most growth in the software and services sector is derived from large-scale projects in banking, financial services, government administration, telecommunications and industry.

Strong growth in the number of personal computers (PCs) has been recorded in the CC13 – 27% in 1999. However, there are significant differences between candidate countries. While the density of PCs in Malta, Cyprus, Estonia and Slovenia reaches EU15 level, Bulgaria, Romania and Turkey are lagging behind (see Table 1). In most of the CC13, there are more than twice as many business users of PCs as home users, except in Turkey and Estonia. In particular, in Latvia and Bulgaria, less than 15% of households have computers[38]. It is also interesting to note that according to the Romanian IS report[39], 54% of all PCs purchases in 1998 were made by business users, while purchases by home users and small offices amount to only 8.9% and 12% respectively.

Generally, the biggest end-users in the IT market are ministries, state-owned organisations, big enterprises and commercial banks, all situated in the major cities. Furthermore the offices of IT companies are normally close to their biggest customers, further depriving individuals and SMEs in smaller towns. The low GDP and income level of the population is one of the explanations for the disparities in IT use. However, the lack of computer skills and awareness of the possible opportunities offered by IT for individuals and enterprises need more attention. In particular policy should address the need to overcome psychological and language barriers. This makes the development of user-friendly interfaces and technologies especially important, as well as the provision of customer support and easy-to-use guidelines in the local language.

[35] Eurostat (2001d)
[36] Data for 1999, World Development Indicators 2001
[37] Kubielas et al. (2000); see also Datamonitor (2001)
[38] Eurostat (2001d)
[39] EU/CEEC JHLC (2000), p.133

1.2 Competitiveness of the ICT industry

The competitiveness of the ICT industry has been high on the European policy agenda since the first debates on the White paper on Growth, Competitiveness and Employment in 1993. In the framework of the EU/CEEC10 dialogue on Information Society development, started in 1995, candidate countries, with the active support of the EU, were able to join forces in creating a favourable framework for the development of telecommunications and wide usage of ICTs.

The recent commitment of the CC13s' governments to the eEurope+ Action Plan underlines the emphasis they put on ICTs as a tool for speeding-up the economic transformation and facilitating European integration. However, it is important to look at how the whole economic transformation towards EU accession is influencing the ICT industry in candidate countries. The general framework for doing business, and in particular the ICT political and regulatory framework, the availability of financial resources and investments, the speed of restructuring and liberalisation in the sector have an impact on the competitiveness of the industry and the overall take-up of the sector. Considering the main trends and challenges of the ICT industry in the CC13 and their future ability to compete in an enlarged European Union, this section addresses the particular challenges at the level of regulations to facilitate industrial growth, competitiveness and consumer protection.

Industrial position

The economy in all candidate countries is undergoing wide transformations in order to meet the criteria of a functioning market economy. In CEEC10, in particular, the process of economic transformation – changes in market rules, introduction of competition and privatisation, as well as the collapse of the traditional export market in Eastern Europe – has had many consequences for the domestic industry[40]. The industrial structure has been fully reshaped in some countries after losing the benefits of the former socialist co-operation and the disintegration of the state distribution and marketing network. The macroeconomic instability, combined with delayed reforms in some CEEC10, further influenced the economic decline and caused a number of domestic companies to lose their place in the market (many have gone bankrupt). The survival of companies has been highly dependent on the speed of change in their productivity and competitiveness. Having access to and acquiring and applying new technologies has been one of the most successful strategies for the enterprises of the CEEC10.[41]

Foreign direct investment (FDI) was a key vehicle for technology transfer and innovation and facilitated the growth of many enterprises. It allowed them easy access to foreign finance and markets, and the means to retrain and keep knowledgeable employees. Despite the appearance of a 'dual economy' of modern foreign-owned enterprises and less-developed domestic enterprises, FDI essentially facilitated the speed of change in the countries able to attract it and caused growing differences in the previously unified CEEC10[42].

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[40] Brandsma et al. (2001)
[41] Gourova et al. (2001b)
[42] Eurostat (2000b), Havlik et al. (2001)

Table 6: Main companies providing back-end microelectronics services in Bulgaria

Company	Location	Markets in %		Staff
		foreign	home	
Technological Centre - Institute of Microelectronics SPJSC	Sofia	10	90	58
Sillway Semiconductors JSC	Sofia	100	-	234
	Botevgrad	100	-	30
Hybrid Integral Circuits JSC	Sofia	95	5	96
	Botevgrad	95	5	22
Innovative Microsystems SPLtd.	Sofia	100	-	40
Expect SPLtd	Sofia	100	-	150
Melexis - Bulgaria SPLtd.	Sofia	100	-	70
Semkotech Engineering SPLtd.	Sofia	95	5	25
Konel Ltd	Botevgrad	60	40	12
EPIQ Electronic Assembly Ltd	Botevgrad	100	-	546
Autoelecronics	Plovdiv	90	10	120
Asterics Electronic Ltd	Plovdiv	50	50	12
Sky Gate JSC	Sofia	100	-	48
Zigert Bul Ltd	Plovdiv	100	-	45
Oimik SPLtd	Botevgrad	100	-	37
Hybrid Microelectronics JSC	Sofia	10	90	8
	Botevgrad	88	12	10

Source: Centre for Economic Development, 2001

Table 7: Gaining and losing industries in exports to the EU15, 1995-1999

		BG	CZ	HU	PL	RO	SK	SL	EE	LV	LT
TV, radio and recording apparatus	Exports 1999, Euro mn	13.3	135.6	1548.3	556.9	-	47.7	-	91.5	-	15.5
	Average annual change (%)	84.8	31.4	52.9	59.2	-	39.9	-	56.5	-	72.8
	Competitive gain 95-2000	11.8	74.5	1167.9	440.5	-	31.0	-	71.1	-	13.1
	Market share in EU15, 1999 (%)	0.08	0.81	9.26	3.33	-	0.29	-	0.55	-	0.09
TV and radio transmitters, apparatus for line telephony	Exports 1999, Euro mn	3.2	62.7	62.4	-	32.0	-	-	221.2	-	-
	Average annual change (%)	62.9	63.1	49.0	-	179.3	-	-	316.1	-	-
	Competitive gain 95-2000, Euro mn	2.5	48.6	42.2	-	31.2	-	-	220.0	-	-
	Market share in EU15, 1999 (%)	0.02	0.43	0.42	-	0.22	-	-	1.50	-	-
Electronic valves and tubes, other electronic comp.	Exports 1999, Euro mn	7.4	326.9	332.8	196.9	-	40.8	43.9	-	-	*32.4*
	Average annual change (%)	20.0	29.8	68.1	12.9	-	35.0	12.0	-	-	*4.0*
	Competitive gain 95-2000, Euro mn	2.8	177.3	278.6	39.4	-	24.8	7.6	-	-	*-3.7*
	Market share in EU15, 1999 (%)	0.03	1.24	1.26	0.75	-	0.15	0.17	-	-	*0.12*
Office machinery and computers	Exports 1999, Euro mn	-	188.8	1879.4	-	57.2	128.9	12.5	*29.9*	1.8	-
	Average annual change (%)	-	20.0	109.8	-	167.0	149.8	16.1	*-16.4*	85.5	-
	Competitive gain 95-2000, Euro mn	-	58.4	1740.3	-	55.6	124.2	2.6	*-57.7*	1.6	-
	Market share in EU15, 1999 (%)	-	0.31	3.13	-	0.10	0.21	0.02	*0.05*	0.0	-

Source: WIIW (2001)

As mentioned above, government emphasis on the need for new information and communication services and the demand by industry and individuals facilitated the development and the speed of changes in the sector. The new regulatory framework in telecommunications had a major impact on the ICT industry.

The domestic ICT industry in the CEEC10 has undergone important changes during the transitional period. Some countries have lost their strong specialisation in electronics and microelectronics[43]. In Latvia electronic manufacturing giants either disappeared or were transformed into smaller competitive, customer-oriented enterprises. Besides the transformations due to domestic economy changes, the ICT industry has been influenced by the global changes. The trend toward globalisation of production processes and building world-wide production chains for various tasks has provided new opportunities for the CC13 to catch up with technological developments and integrate themselves in world wide production networks. The availability of highly-acknowledged designers of integral circuits and technologists has attracted FDI in Bulgaria, for example, and contributed to the further development of the microelectronics sector, producing mainly for niche markets in Europe (e.g. Germany, Belgium, France, Sweden, Denmark, UK, Turkey, etc.), US and Canada (see Table 6).

Recent analysis of the Vienna Institute for International Economic Studies (WIIW)[44], indicates that in many CEEC10, manufacturing industries belonging to the ICT sector are increasing exports to the EU15 (see Table 7). It is obvious that many CEEC10 retained their electronics manufacturing or established new production facilities capable of going beyond national borders and exporting to the EU15. Hungary is in a very strong position, as it has significant specialisation in office machinery and computers and electronic components, as well as in TV, radio and recording apparatus industry. In Poland TV, the radio and recording apparatus industry has been a top exporter since 1995, and in Estonia the first place is taken by TV and radio transmitters and apparatus for line telephony industries. The Czech Republic has also developed ICT industrial branches able to export to EU15 countries. Malta has a comparative advantage for electronic products, which accounted for about half of its exports in 1999.[45] The Turkish electronics industry also exports consumer electronics and telecommunications equipment and achieved an output of 1.6 billion USD in 1996.[46]

Information technology industry

As already pointed out in the previous section, the IT market has experienced remarkable growth in the past few years, mainly due to government procurement projects and foreign investments in the country. However, without financial resources to modernise their production, IT companies in most candidate countries have been unable to compete with multinationals and have shrunk into small producers in limited niche markets. Many firms in the computer industry have been integrated in the product life cycle of western companies through subcontracting or outsourcing, assembly, distribution, reverse engineering, etc. Estonian IT companies, for example, are becoming more and more integrated into the supply chains of their Scandinavian counterparts – thus getting leading edge know-how and project management expertise. Recent US market research indicates that Estonia with its well-educated population and government emphasis on ICT development is an 'excellent test market for new technologies'[47].

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[43] Centre for economic development (2001), p. 62 and 74
[44] Havlik et al. (2001)
[45] Eurostat (2001b)
[46] Acar et al.(2001);

In the emerging personal computer industry, new private firms have focused exclusively on assembling foreign imported components, achieving a high market share, e.g. in Poland two domestic leaders have dominated the market with over 70% of all PCs sold. In Bulgaria, a big former producer of computers and peripherals for the large Soviet market, there are no domestic production facilities and multinational companies dominate the hardware market (US companies taking 85% of the import and 58% of the total market). Foreign IT companies are the main suppliers for large enterprises, banks and the government, while local companies assemble 40% of the computer hardware, taking in overall 25% of the total computer hardware and peripherals market.[48]

The rapid changes in technologies after the collapse of socialism and the introduction and absorption of new western hardware technologies required a completely different kind of software for systems and applications. The availability of well trained IT specialists in CEEC10 facilitated the technological changes. Many small IT companies have emerged, sometimes set up by employees of universities, IT research institutes or former large IT companies (see Box 5). Also, in order to benefit from local expertise, many foreign companies have invested in software houses (e.g. in Estonia, Bulgaria, Hungary, etc.), and others have outsourced their work using the advantages of the good quality and low prices on computer software markets in CEEC10.

Box 5: The software industry in Latvia

Latvia had one of the most advanced IT infrastructures in the former USSR, a result of the heritage of highly qualified human resources. Since the early 1990s the growing local demand of IT services and the opportunities to offer these services to Western companies have attracted to the sector many skilled entrepreneurial people. Originators of new companies have been highly qualified researchers from universities, research institutes and computing centres. The outsourcing of software has become the core competence of several Latvian software companies, providing high-quality and cost-effective services. Given that financial institutions and newly established enterprises have been developing their IT systems from scratch, the amount of internal spending was also considerably high. Besides, software maintenance, integration, consulting and training are rapidly growing areas.

It is estimated that Latvia has around 100 software development companies, 25-30 of which regularly undertake sizeable projects. Several companies have moved from the provision of cheap software solutions as sub-contractors to becoming the main contractors in complex areas like system integration.

One of the weaknesses of Latvian companies is their small size that hampers the opportunity to offer directly to the large customers outsourcing services. The lack of marketing skills in many companies, as well as the mismatch between university training and practice are also important drawbacks. The insufficient government support and access to venture capital are further limiting the competitiveness of IT companies in Latvia.

(Ernst&Young, 1999)

Local firms play an essential role as system integrators, value-added service providers, software developers and training centres, dominating the segment for computer-connected services like installation, implementation, training, etc.[49] Many domestic software companies have exploited the local knowledge of customers and the local language as competitive assets. Consequently, small domestic companies (normally with no more than 10 employees) are often ahead of foreign companies in the local market in areas like company management, financial accounting software, banking software, software for SMEs, etc. While independent local firms experience high growth in the area of applied software, foreign companies dominate the market for system software and general-purpose software, distributed by authorised dealers.

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[47] CEEBIC, http://www.mac.doc.gov/eebic/countryr/estonia/market/EstTeleServices.htm
[48] Kubielas et al. (2000), CEEBIC, http://www.mac.doc.gov/eebic/countryr/bulgaria/market/bghardware1.htm
[49] Weber et al. (1999)

Telecommunications industry

The economic transformation, in particular new market rules and liberalisation, changed the whole landscape in CEEC10, allowing a number of new market entrants to offer a wide diversity of products and services. The inability of domestic manufacturers to supply up-to-date equipment and technologies has led to a market dominance by foreign companies through their newly established local subsidiaries or joint ventures with leading domestic suppliers. Estonia, for example, has been selected as a manufacturing and assembly centre by high-tech Scandinavian and western companies.[50] In particular, telecommunication manufacturing is characterised by limited competition and the admission of major international companies, e.g. Ericsson, Siemens and Alcatel, as suppliers to the national operators.[51] The market for mobile handsets is driven by technologies used by the operators and the corresponding western producers dominate the market. On the other hand, the liberalisation of the equipment market and the introduction of internationally recognised technical standards allow a number of companies to be involved in the provision and distribution of the respective equipment and technologies. In general, local companies have a very limited role – in most cases involved in distribution and maintenance, sometimes in adaptation of foreign products to domestic conditions.

The telecommunication market in the CC13 is still dominated by incumbent operators and domestic capital. However, this is changing with the entry of new players to the market and changes in ownership (see Table 8). At the moment incumbent operators and, indirectly, their joint ventures are still partly state owned. However, since privatisation, State shares in these companies have decreased with government keeping only the 'golden share'. In most of the CC13 licenses have been granted to gas and electricity companies to build closed-user networks[52], which might also cause significant market changes. The increased competition in the telecommunication market present incumbent operators with the challenge of solving problems resulting from inflexible structures, lack of skilled manpower and market experience, as well as the relative inability to address users expectations for new services and quality.

The Internet market is highly fragmented in most candidate countries and is dominated by private domestic companies or joint ventures with foreign telecommunication operators. In Turkey, however, the largest ISPs are usually subsidiaries of media corporations, banks or GSM operators, the parent company playing a major role for proliferation of Internet.[53] In some CC13 (e.g. Latvia, Hungary, etc.) there are trends towards ISP mergers and consolidations. At the same time special bodies for setting-up administrative and academic backbones take a large share of the Internet traffic. The

[50] Eurostat (2001b)
[51] Sadowski, B.M. (2000)
[52] ESIS (2000b)
[53] Acar (2001)

provision of Internet access by mobile companies and cable operators further increases competition in the market and might lead to significant price decreases in the near future.

The cable TV market is experiencing structural changes in many countries (e.g. Bulgaria, the Czech Republic, Latvia, Estonia), related to the growing need for modern services, including interactive services, such as telecommunication services and the Internet. Local companies in many cases lack the investment for building two-way communication channels, as well as for broadcasted content fees. Consolidation is taking place in some countries, e.g. the Czech Republic, Latvia, Bulgaria. Moreover, foreign companies are being attracted onto the market and are acquiring growing shares at a regional and national level. It should be noted, however, that monopolies, like that of the Turk Telecom in Turkey or Melita Cable TV in Malta, might hamper the development of cable TV networks and the provision of cheap access to interactive services for local customers in the future.

Competition on the mobile market in most of the CC13 is strong due to the presence of at least two operators and the dominance of foreign capital[54]. The introduction of new services and new technological solutions like HSCSD, GPRS is giving companies some competitive advantages only in the early stage of their introduction on the market. The expected high growth in mobile applications and services will also make mobile companies more competitive on the Internet market, especially when targeting groups of business clients. The development of m-commerce opportunities will further enhance the mobile operators' advantages on the market.

When looking at the competition in the telecommunications market, the deployment of satellite services also needs to be taken into account. Satellite systems offer many opportunities for business clients – building of corporate Intranets, efficient enterprise resource planning, control and management of mobile objects, broadcasting of important events, etc. In CEEC10 the liberalisation in telecommunications allowed many new companies to enter this market segment and to develop VSAT systems or extend the Internet connectivity using VSAT point-to-point communications. New satellite services are also offered for navigation, data transmission or telephone connection, for satellite news gathering, etc.

As result of the recent changes in the international satellite organisations Inmarsat, Eutelsat and Intersputnik, the monopoly of the previous companies, signatories to the respective Operational agreements, has fallen fully. Consequently, new service providers have entered the market and have the opportunity to communicate directly with the commercial structures of the satellite operators and to offer a range of satellite services to end-clients. In the case of Inmarsat new companies have emerged (e.g. Scortel Ltd. in Bulgaria, Guards Telecom Co. Ltd in Hungary, EPA Ltd in Poland, Pramacom Prague s.r.o. in the Czech Republic[55]) and increased the competition for large corporate clients in the areas of transport, energy, etc.

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[54] Cullen International (2001)

[55] http://www.inmarsat.org

Table 8: Competition on telecommunication markets

Country	Target date for full liberalisation	Current competitive status	Number of mobile operators	Data transmission	Cable TV	Internet
Bulgaria	1.1.2003	Monopoly	3	BTC + 2 nation-wide networks Must use BTC infrastructure	513 operators	>200 ISPs
Cyprus	1.1.2004	Monopoly	1	C.Y.TA. only significant		C.Y.TA. + 4 ISPs
Czech Republic	1.1.2001	Competitive	3	73 licences	40 operators[1] 712,000 subs	125 ISPs
Estonia	1.1.2001	Competitive	3	Several operators	70 operators	9 ISPs
Hungary	1.1.2002	Regional monopolies	4	>20 licences	1200 operators 1.4 mill subscribers, 37% of households	39 national + 23 regional[2]
Latvia	1.1.2003	Monopoly	2	Only with Lattlekom infrastructure	Not to be used for telecom	Several operators
Lithuania	1.1.2003	Monopoly	3	Multiple operators Only with LT infrastructure	Competitive 213,000 subscribers, 15% of households	10 ISPs
Malta	1.1.2003	Monopoly	2		Monopoly with Melita Cable TV. (Potential tc competitor 82,000 subscribers, 68% of households	13 ISPs
Poland	1.1.2003	Regional duopoly	3	Fully liberalised	Competitive 30% of households	350 ISPs
Romania	1.1.2003	Monopoly	4	20 licences[3]	10 national operators and many local operators. 3 mill subscribers, 41% of households	>15 ISPs
Slovakia	1.1.2003	Monopoly	2	23 licences	119 operators 700,000 subscribers, 36% of households	app. 80 ISPs
Slovenia	1.1 2001	Transition from monopoly to competition	2	Liberalised	80 operators 90% of households	34 ISPs
Turkey	1.1.2004	Monopoly	4		Türk Telecom monopoly 425,000 subs	>80 ISPs

Source: adapted from Cullen International (2001)
1) 1.1.1999 2) 1.1.2000 3) 1997

1.3 Challenges

Turning the ICT sector into a sector of economic growth

Trends in the markets of telecommunication services and equipment, and IT services and hardware show the ability of local industry to use their knowledge of local customers as a competitive advantage in finding market niches, and even going beyond national borders. Although the computer industry in general is limited to some niche markets and assembling activities, the applied software sector is dominated by domestic enterprises. It is most likely that future growth in the ICT industry in the CC13 will be based on cultural and linguistic advantages and the increasing demand by the population and enterprises for local content and applied-software services.

The telecommunications sector is still dominated by local enterprises. However, changes of ownership of incumbents and the interests of foreign companies, especially in interactive and mobile services, will change this picture soon. The rapidly changing technological environment and the growing number of market entrants increase competition and present the local telecommunications companies with the challenge of preserving and further expanding their market presence. The consolidation of small domestic companies could be important for their ability to compete with powerful foreign market entrants. However, local enterprises often fail to attract skilled human resources and lose their place in the market due to their limited financial resources.

Although the CC13 are not able to compete with major foreign manufacturers and leading multinational ICT companies, they might attract them with the possibility of market expansion. The most successful candidate countries were able to engage foreign companies in investment in domestic manufacturing and technology transfer. The public procurement policy and investment climate could be used as important tools for further development of local branches of the ICT industry, especially where domestic traditions and experience are available. Internet infrastructure is highly dependent on investment capabilities of the industry. Therefore lack of foreign direct investment is likely to slow the pace of Internet growth in candidate countries.

Challenges to regulation

Ensuring Fair competition: With market growth new problems emerge, related to market dominance and anti-competitive behaviour. The demands on regulatory and competition authorities are increasing in this dynamic changing environment. Newly established industrial associations may have a positive influence on fair competition safeguards and the development of professional ethics. The growing competition between companies offering similar services is also likely to foster their customer orientation, essential for successful market behaviour. Regulatory and competition authorities in the CC13 therefore face the challenges of equal treatment of operators and fair competition safeguards, particularly when providing limited resources (e.g. frequency allocation or assignment of numbers and addresses). The interconnection, Internet peering and settlement, are likely to further increase the complicated task of telecommunication managers and newly established regulators. Moreover, the CC13 need to create a forward-looking policy and legal framework, capable of facilitating on-going development without hampering possible technological leapfrogging. Internet governance and safeguarding of fair competition rules by the management of country top-level domains and provision of IP addresses to the ISPs also require particular attention.

Securing the networks and creating a framework for trust and confidence: Despite candidate countries efforts to follow the new technological solutions for reliable and secure systems and to adopt regulations for encryption, digital signatures and rules against cybercrime, a big challenge for them is to mobilise all technical, organisational and other means to safeguard electronic communications and transactions. The deployment of smart cards, the introduction of privacy and security enhancing technologies might also facilitate the use of the electronic networks. Secure networks are not the only requirement for consumer trust and confidence in new services. The legal framework for electronic commerce and the law enforcement mechanism for 'cyber-crime' are particularly important. Furthermore, the opportunities for self-protection of users might have an impact on building trust and confidence. Actual products or services purchased, as well as the conditions of supply, need appropriate guarantees. In addition, on-line consumers need easy, quick and affordable access to a redress system for dispute resolution.

Addressing the complex digital divide

Despite the growing use of ICTs in the CC13 and their potential for leapfrogging, there are also serious risks that ICTs will further widen the existing gap between rich and poor, young and old and endanger social cohesion and democratic participation. The following issues emerge in that respect:

Equal access to networks: Low investment opportunities of incumbent operators and purchasing power of the population limit the growth of the sector and the achievement of a critical mass of users. The growing divide in access to telecommunication services might lead to increasing social isolation of individuals and regional disparities. Therefore, an important objective of telecommunications policy is to ensure that all citizens and businesses have equal opportunities to use modern, efficient and high-quality technologies and services. However, the ability of the CC13 to sustain a universal service policy for telephone connection for everybody needs further study.

Affordable local access: The issue of affordability is central in bridging the divide in access to new services. The regulatory authorities need to balance an affordable price policy for universal service with the process of tariff re-balancing, which leads to higher prices for local calls and leased lines. The introduction of competition at a local level and local-loop unbundling are considered to be possible ways of achieving affordability.

At the same time, universal access is highly dependent on the availability of networks and the provision of high-quality services to users. The development of alternative access technologies, e.g. wireless, satellite and cable, might facilitate the leapfrogging of infrastructure deficiencies. Their spread, along with increasing competition in the market, provides opportunities for faster Internet connection at lower prices.

Equipment and services use: The respect of consumer rights and the participation of all in the IS raises issues for user support and the need for specific equipment and interface for disabled people. On the other hand, the process of globalisation requires that equipment, interfaces and services are based on international standards to ensure interoperability and ease of use. The IT industry in the CC13 needs to respond to the global challenges for harmonised systems, which are equally accessible to their local customers.

SMEs and regional focus: The provision of opportunities for new technology deployment to SMEs and individuals in those less developed regions and rural areas most affected by the digital divide requires particular attention. The development of specialised networks (like administrative and research), as well as setting-up public access centres, might have an impact on access provision to disadvantaged regional communities in the long run. The preferential treatment of similar centres, and the development of SME oriented centres, especially in less developed regions, might contribute to overcoming their isolation and low technological status, create new opportunities for people and enterprises and foster innovation.[56] SMEs and regional development is a key debate issue in many countries, however there is a need to focus on ICTs use in SMEs and introduction of real practical measures and support.

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[56] also Gourova et al. (2001b)

Chapter 2
Info-structures and content

CC13 have the opportunity today of making the most of the production and provision of content because of linguistic diversity, cultural heritage, media pluralism, technical and media competencies, and pre-existing supply capacity and knowledge base.

The public availability of electronic sources of information, knowledge and culture, and the access to on-line applications for health, education, transport, etc. could give wide opportunities for innovative socio-economic developments, enable governments to meet democratic objectives and contribute to enhance communication among citizens and businesses. Simultaneously, governments would fulfil their role as a driving force towards an Information Society for all.

The private sector has a vital role in this move. While incumbent media companies further develop in re-purposing and cross-promoting content across multi-channel distribution, net-native companies may intend to offer targeted contents or delivery options in niche markets. More generally speaking, e-commerce and its main pillars – business-to-business (B2B) and business-to-consumers (B2C) – could create new internal co-ordination means, new market relations, new sources of profit, new business models and new virtual companies.

In developing *info-structures*, CC13 share, sometimes with a slight delay, the same difficulties as most Member States. Their content industry and their public services, however, also show specific assets and weaknesses that are worth analysing with a view to targeting the most effective opportunities.

2.1 Content provision

The strong development of public on-line content provision

Public web sites and portals

During this last decade, CC13 populations have been offered generalised access to international information sources but there has also been a blossoming of national on-line content initiatives. The latest have been supported to a large extent by language barriers,[57] but also by the rapid growth of domestic web sites, e.g. of ministries, higher education institutions, local authorities, libraries, etc., facilitating access to local content (Table 9). These initiatives may play a particular role in developing virtual communities, providing opportunities for communication and exchange of ideas through discussion forums, chat, virtual clubs, etc., supporting economical development, as well as facilitating access to various on-line services, e.g. travel bookings, tourist information, etc. Consequently, most public authorities in CC13 focus on the establishment of new information systems and public registers and the modernisation of existing ones, as well as the provision of on-line access to public information. However, these dispersed information sources, found in various public bodies at national and local level, make it very difficult for citizens and businesses to access and use them. Therefore, the trend for 'one-stop-shopping' gains increasing importance in the communication between public institutions and citizens or industry. The lack of experienced specialists in public administration for managing web sites, creating customer-oriented interdepartmental information and offering regular updates of on-line information, even though perceived as a weakness, is an opportunity for outsourcing these activities and for the growth of SMEs exploiting the potential for added value services based on public information.

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[57] According to the Internet Society, more than 80% of web pages are in English, although only 57% of Internet users have English as their mother tongue, quoted in ITU (1999)

However, today, the content of electronic public information is still limited, often giving only basic descriptive information and contact details. Some initiatives for tax payment over the Internet and announcement of governmental decisions and public tenders are seen as the first steps towards government-to-business (G2B) and government-to-citizens (G2C) commerce.

Table 9: Public Supply: Percentage of web sites per sector

	Primary, secondary schools	high schools, universities	ministries	local authorities	hospitals	museums	libraries
Czech Rep.	27	86.9	100	12.9	62.2	52.1	7
Cyprus	6	38	100	n.d.	8	11	1
Estonia	37.8	75.8	100	66.8	28.2	26.8	4.3
Hungary	28	30	100	21.42	52.87	19.91	9.5
Latvia	14.1	84.8	100	14.3	8	77.4	2.4
Lithuania	11.6	100	100	16.5	22.1	93.75	17.2
Malta	6	4	35	21	20	21	2
Poland	14.5	90.6	100	51	19	17.7	6.3
Romania	0.5	17.8	62.5	9.2	1.9	1.8	0.1
Slovakia	1.67	100	100	9	11	33.7	75
Slovenia	84	89	100	70	54	45.9	96.9
Turkey	1	100	100	4	6	30	8

Source: ESIS, 2000

Table 10: Demand for National Information Infrastructure Services in Turkey

SERVICES	Demand (%)
Finding out and paying telephone, tax, water, etc. bills due and payable	86.2
Submitting petitions and receiving answers	75.5
Booking and receiving tickets	73.5
Exchanging information	73.2
Cinema, music and other cultural events	73.2
Participating in debates and votes	69.6
Receiving a lycée/university diploma or a course certificate	66.8
Access to libraries, museums and art galleries	64.9
Viewing and buying goods	62
Making bank and stock exchange transactions	58.5
Lodging job applications	57.2

Source TUENA, 1999

The strong demand from businesses and the civil society stimulates in its own turn the provision of governmental interactive services and on-line content. A survey in Turkey[58], for example, outlines the very favourable attitude of the population to the use of national information infrastructure for communication with other people or enterprises, for access to public services, information and culture (Table 10).

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[58] TUENA (1999)

Public services and applications

The development of IS applications in healthcare, transport, culture, tourism, etc. is also gaining importance in the CC13:

- In all countries, education seems to be the leading application sector, mainly at higher education levels (see Box 6). The publicly-funded broadband networking and the early use of ICT-based communication tools are some originating factors of this trend.
- A number of projects have focused on preservation of traditions, folklore and national heritage for future generations making them available to other people all over the world.[59]
- Access via the Internet has been provided to many large public libraries, virtual museums, art galleries and music fairs (e.g. in Hungary the Index and Origo portals, and also specialised sites such as Fotex.hu, 673.hu, etc).
- The deployment of global positioning systems, sophisticated traffic monitoring and management systems, and travel information services aim to improve transport efficiency (see Box 7).
- In the area of healthcare, the potential of ICTs has been used in various cases for improving the quality of medical services and making specialised knowledge available to hospitals or primary healthcare organisations (see Box 8). In addition, scarce specialist healthcare resources have been deployed efficiently using network techniques, in particular remote diagnosis and consultation.

Box 6: Findings of the ESIS database (2000)[60]: Domains of application

- Education and training is the leading application sector, with 327 projects in the CEE countries and 188 in the Mediterranean region. In the CEE countries, 104 projects are for higher education and 111 are for adult training. 108 projects are aimed at the primary and secondary school sector. This breakdown is mirrored in the Mediterranean zone, although with smaller overall numbers (53 in higher education, 51 in adult training, and 66 in primary and secondary education).
- Tourism and manufacturing are also important sectors, respectively ranking 2nd and 4th as sectors targeted, projects being financed by ministries of tourism and telecommunications.
- Public administration services are another important application sector (with 160 projects in CEE countries and 57 in the Mediterranean region). In Eastern Europe projects are mainly aimed at providing citizens with access to public services at a local level (81 projects) or nationally (80 projects). In the Mediterranean region, 37 projects provide national services and 28 local services.
- 27% of the projects in the CEE countries and 23% in the Mediterranean zone are for healthcare sector applications. In the countries covered by these studies, this sector frequently experiences significant financial problems, which explains the relatively low level of IT projects in this area.

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[59] e.g. the Czech http://www.czechfolflore.cz or the Estonian http://www.wm.ee/eng/comesee/

[60] "Information Society projects use data processing and telecommunications technologies to support innovative methods of communication between members of society for a wide range of purposes (e.g. education and training, healthcare and social care, culture, administration, industry and commerce, research & development, etc.). Projects of this type will generally be interactive (two-way communication between users and systems or among users) and involve remote access (with users and systems able to

Box 7: ICTs for transport efficiency and safety

Like elsewhere in the world, in CC13 also the deployment of Global positioning systems (GPS), Geographic information systems (GIS), Global Navigation Satellite Systems (GNSS) gains importance for increasing the efficiency of transport management. The introduction of satellite-based GPS allows many companies there to avail themselves of the opportunities for better control and monitoring of vehicles and ships, as well as higher effectiveness of enterprise resource planning using regular position reporting, information for speed, distance travelled, etc. In the case of Inmarsat[61], compact and easy-to-use units mounted on the bridge, in the cab or in the cockpit allow active management of fleets and large vehicles, active surveillance of cargoes from dispatch to delivery – both essential to success in present transport industry. These units deliver regular automatic reports on vehicle and cargo status back to company control centres. Besides, drivers or crew can send and receive brief messages to report problems or seek instructions even when they are far beyond the coverage of ground wireless systems.

Many CC13 are using for years the maritime services to facilitate the navigation at sea. With the advancement of ICTs, the availability of electronic charts with information for shifting sands, crumbling coasts, new buoys, etc. and the delivery of recent weather forecasts, ice and severe-weather warnings, etc. assist ships to adjust their routes to minimise risk and delays or take advantage of emerging favourable conditions. After the liberalisation of telecommunications, as mentioned in Chapter 1, companies in CEEC10 had the opportunity to make use of land mobile services. In particular, the deployment of intelligent transport services, e.g. GIS, up-to-date information for traffic density, allows vehicles to avoid delays in delivery of goods, as well as to optimise their routes.

Box 8: Telemedicine networks example

The *Baltic International Telemedicine Network (BITNET) project*[62] aims to establish and implement sustainable PC-based digital telemedicine networks between the main healthcare institutions in Estonia, Latvia, Lithuania and the Uppsala University Hospital in Sweden. The project has included clinical applications for radiology, neurophysiology, tumour treatment, family medicine and video-conferencing for education and consultations in different medical fields.

The *Baltic Sea Network on Occupational Health and Safety*[63] is a regional network of 10 countries which aims to offer a joint forum for the development of occupational health and safety (OH&S) in the region, including such activities as making OH&S related information accessible through a telematic information system on the Internet. Their network also supports candidate activities of the Baltic and Eastern-European countries. The focal point of the network is the Finnish Institute of occupational health.

In *Malta*[64] with the assistance of ITU and Telia Swedtel has been carried out a telemedicine project ensuring connections between two hospitals on the islands Malta and Gozo and a Hospital for sick children in London. The main application included in the project focus on clinical case discussions and/or interactive education and training, analysis of ultrasound images of heart and ECG signals and interactive case discussions on diabetics.

Notwithstanding these many projects, the challenges public services and governments of the CC13 are still confronted with in this area are numerous:

- The final objectives for development of interactive on-line access to public information cannot be reduced to mere support to ICT awareness.
- Beyond web sites, flows of information and possibly interactivity, policies are needed for targeting at an efficient and democratic society, with citizens and

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communicate over a distance). Projects may have a societal dimension or will possibly serve as a model for other organisations and businesses." European Survey of the Information Society, 2000. At: http://europa.eu.int/ISPO/esis/default.htm

[61] http://www.inmarsat.org

[62] http://www.bitnet.promotor.telia.se

[63] http://www.balticseaosh.net

[64] ITU-D Study Group, Doc. 2/001, 1999

consumers being empowered and showing active participation in the debates and decisions in the public sphere.

- ICTs should also be used to contribute to modern and financially sustainable educational and social systems.
- Finally, ICTs are the foundation of sound economic development. Public content production should also aim at supporting businesses and transactions directly, by facilitating access to business information and to business management (administration, accountancy, taxation schemes, etc.).

Every step taken in the direction of public content provision is a necessary one, but has also to be proportionally assessed in view of the above main objectives.

Towards a blossoming on-line media industry?

After rapid changes during the transitional period in CEEC10, the content industry is now facing the challenges of new technologies. While ICTs offer new opportunities to deliver content and even new forms of content and creativity, electronic networks facilitate access to traditional content in a digital form, e.g. newspapers, entertainment, audio-visual products, etc.[65]

A look at the number of initiatives only in the last few years shows that media production, starting with traditional media such as newspapers, is taking strongly on the Internet. On-line newspapers are normally free of charge on the net, however with less content than their paper counterparts. They sometimes offer reader's feedback or forum opportunities and specialised journals and news archives, mainly as a paid service.

These initiatives, as in EU15 and around the world, are today confronted with the issue of developing a sustainable revenue model.[66] The possibility that any organisation could become an on-line media producer is no longer expected to overturn the media value chain in the immediate future. The Internet could potentially lower the entry levels for content distribution, but this does not imply that any on-line newspaper will be able to survive and make a business out of it. Consequently, finding revenue for on-line content is currently the main driver of change in the media industry. Technology, though an important tool, is only complementary to the core business of content production and distribution. Market dynamics and market power are becoming increasingly important, while governments are expected to support innovation in the on-line content market, mainly by raising awareness among consumers. In such circumstances, it is the financial solidity of the traditional media, and the assessment of the government support to on-line initiatives, which may be decisive in the long term.

As far as broadcasting media is concerned, the newly established regulatory frameworks in CEEC10 have fostered media pluralism and the diversity of programs (see Box 9). The availability of a number of private national and regional TV channels and radio stations, providing broadcasting services via cable, air or satellite, will hopefully increase public choice and the availability of various high-quality programs – educational, information, entertainment, and sports.

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[65] K. Ducatel, J.C. Burgelman et.al. (2001)

[66] Punie et al. (2001)

Attempts have already been made to provide TV broadcasting through the Internet. However, limited bandwidth is a major obstacle for high-quality interactive multimedia and TV services on the web.

The introduction of digital broadcasting will further change the media landscape in the CC13, as in the rest of Europe. The higher quality of contemporary digital technology will widely change the audio-visual programs offered, and also increase mass user interest. On the other hand, the trend towards specialisation in channels meeting the requirements of various groups of viewers, with different ages, interests, and social status, as well as the change from passive to interactive ways of delivery – are further challenges facing the content industry in the next few years.

Box 9: Hungarian radio and TV broadcasting[67]

"In 1996, Act n°1 on Radio and Television Services (Media Law) put an end to the state's monopoly over broadcasting services. (…) In 1998, there were 17 AM and 57 FM radio stations in Hungary. All of the national radio stations are publicly owned. (…) Terrestrial, cable and satellite television broadcasting are available in Hungary. There are three national public TV channels (…), around 26 private commercial TV stations (…) and over 200 regional cable companies. (…) Many foreign broadcasting companies have obtained shares in Hungary's TV channels. (…) Radio and TV broadcasting on the Internet have become increasingly popular. There are about 30 radio stations on the Internet. *Indexradio* is a unique net-native broadcasting company."

Finally, there is evidence in the publishing sector, for example, that CC13 tend to imitate patterns of e-commerce development that have appeared in other countries. This is shown by the mechanisms that enable actors to develop e-business initiatives and the role of institutional factors in influencing these developments. Smaller firms and individual entrepreneurs exhibit more pro-active behaviour in the take-up of e-commerce than larger firms.

This can partly be explained by the underlying philosophy of the larger publishing houses, which believe that bookstores should also serve as meeting places rather than simply as sites where standard commercial transactions take place. They have therefore invested large amounts in establishing such "physical presences" throughout the countries. The majority of firms that have been identified as 'leaders' in e-commerce, however, are more influenced by strategic incentives to position themselves in an emerging market. They also hold the view that e-commerce is an alternative sales and marketing channel that gives them the opportunity to expand their customer base. Sector-based research results also prompt consideration of the role of institutional factors, such as the widespread use of credit cards and the lack of trust regarding the protection of personal data, in influencing the development of on-line markets.

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[67] ITU (2001)

Present and future issues for the media industry

New cross border and satellite broadcasting channels, as well as the Internet, the still to come e-book or MP3, offer wide opportunities to access world culture, art, music, literature, etc. Through digitisation small nations are able to become part of global cultural and information space, by broadcasting or providing access on the web to their creative achievements. At the same time, this potential is countered by economic globalisation processes. This is even more of a problem in the CEEC10 as their young and comparatively unstable media systems are more sensitive and more exposed to the dangers of globalisation (Box 10). Thus globalisation offers both opportunities and drawbacks for the info-structures. The benefits of sharing knowledge and opening markets are counterbalanced by the danger that mergers may trivialise local content.

For the media industry, which is a major content producer and, as is shown in the EU 15, case an important source of job creation, the challenges of tomorrow are clear-cut:

- Part of today's transformation in the media industry relies upon mergers between traditional and not traditional companies, at national and transnational level. These moves generate a variety of consequences at both managerial and content level.
- Second, most on-line projects are putting their trust in paid provision of on-line content in response to the collapse of other sources of revenue (States, advertising). The financial sustainability of existing and new initiatives will depend upon the revenue model companies develop now. If not strongly backed-up by mother companies, venture capital or alternative sources of revenues, many of the existing projects may well disappear as rapidly as they emerged.

If CC13 media, in particular their on-line branches, can capitalise on the essential assets of language and localisation, they can be expected to flourish. However, they will also go through serious transformation and consolidation processes in the next few years.

E-commerce trends

Government initiatives and technological development in the CC13 are pro-actively focused on the establishment of a favourable environment for development of e-commerce and a knowledge-based economy. Despite these many efforts, CC13 societies are still not prepared to take advantage of e-commerce.

Business players have undertaken different initiatives – providing end-consumers with on-line access to databases, creating virtual shops or taking first steps towards setting-up systems for e-banking and e-business (see Boxes 11 and 12). However, the market of B2C is still very limited. The few customers that use the Internet do so predominantly to receive information and to order products or services, paying on delivery.

B2B commerce is also in its infancy – companies use electronic networks mainly to access market news and analysis, new business offers and to communicate with suppliers, while contracts and business deals are carried out by direct contacts and by traditional means.

Box 10: Fears about the impacts of the globalisation processes

In Latvia, for example, the 1999 UNDP report raises the issue of the further decreasing audience for national media due to globalisation. In this country the audience is split on the bases of language differences (Russian and Latvian) and the new national media channels are focused to the mass audience and do not provide significantly diverse information, analysis and reviews in national media. This creates a danger that the more educated viewers, also knowing foreign languages, might drift away. This goes in line with the challenge of stabilising the content industry economic and regulatory environment, which suffers from a missing backbone of standards that form the pillars of a solid media environment since the political transformation of the whole region. The collapse of incumbent national media operators and the loss of their international contacts and connections have left a void, which has yet to be filled.

Box 11: E-commerce trends – the Polish case[68]

Approximately 87 % of Polish companies have access to Internet and over half have their own web sites. The amounts invested in the Net grow at the exponential rate. According to different estimations, at present 300 to 500 companies sell goods on the Internet and the value of B2C Internet sales is 3.2 - 4.3 million dollars. There are analysis pointing out that B2C transactions will constitute only 8 % of the value of B2B transactions. According to the data collected by Andersen Consulting, the average turnover of a Polish e-shop amounts to approximately 50 thousand zlotys.

A regional survey of 100 selected SMEs with ten to ninety employees, carried out twice in 2000 and 2001, shows that 91% of them in 2000 (85 % in 2001) regard the possibility of making information about the company available to the customers as the most important advantage of the Internet. Exactly 75 % (60 %) believe that it is an excellent medium of promotion of products and services and 48 % (46 %) would use it to create the corporate image. This data shows that SMEs treat the Web as a communication rather than sales medium, and this approach has not changed materially over the last six months. For this reason, only 31 % (22 %) of the surveyed companies declare that they use or are going to use the Internet to sell their products or services.

Box 12: Lithuanian initiative towards e-commerce uptake[69]

In 2001 the leading Baltic mobile telecommunications company Omnitel, the fixed telephony monopoly Lietuvos Telekomas and two largest banks of Lithuania initiated the alliance "Window to the Future" of Lithuanian companies and public bodies aimed at facilitating the IS development in Lithuania. The insufficient Internet penetration has been considered to be the main obstacle for the introduction of Internet-based services, e-commerce and Internet banking. There are some expectations that after reaching a critical mass of 15% of technology penetration, a rapid growth of users and market boom will follow. The reason to consider 15% as a threshold is the observed growth on the Lithuanian mobile phones market in 2001: just 15% at the beginning of 2001, and by the end of the year – more than 27%.

Therefore, the members of the alliance "Window to the Future" are seeking to achieve Internet penetration higher than 15% by the end of 2002. The objective of the alliance is to foster the close co-operation of business and public authorities for promoting extensive ICT use. The most important measure to achieve this goal will be to establish public Internet access points and to train the general public to use Internet. According to Omnitel, the largest companies of the IT, telecommunications, banking and other sectors are ready to make long-term investments into IS development aimed at involvement of larger groups as potential customers.

(Dr. Antanas Cenys, Chairman of the Senate of Semiconductors and Physics Institute, Lithuania)

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[68] Chmielarz (n.d.)

[69] http://www.omnitel.lt

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While each candidate country has its specific features, recent overviews found that all face some common technical difficulties[70] for take-off of e-commerce (see Box 13):

- Limited use of personal computers, especially in business. This problem may well result from the overall investment environment in CC13 where, resources being scarce, IT investment may not always be a priority and business risk-taking is little encouraged.
- Insufficient access to infrastructure: the much lower telephone and Internet penetration (which reflects various factors including the absence in most of the CC13 of a liberalised and fully competitive market) and the high cost of Internet access as related to local earnings.
- Absence of a favourable soft infrastructure in which to conduct e-business. This includes security-related issues for e-payment systems.

Box 13: CC13 outlook on e-commerce:

Bulgaria: "(…) Over the near term e-commerce in Bulgaria will grow primarily in the B2B sector, and more slowly in the B2C sector. That is primarily because of the type of consumer behaviour Bulgarians have (…)".

Czech Republic: "(…) Rapid growth of the Internet is expected among the 5000 small and medium companies operating in the Czech Republic. Forty percent of those companies are already on the web, but this has mainly been passive, as they are not ready to provide business transactions. (…) There are currently 1900 stores on-line, which is a 1000 percent increase (from year 1999) (…)".

Hungary:" (…)There are currently about 200 Hungarian companies selling their products over the Internet. (…) the relatively slow increase of B2C e-commerce is due to three factors: low internet penetration, few opportunities of on-line banking, and the lack of efficiently organised home delivery. (…)".

Poland: "(…) E-commerce in Poland is still in the preliminary stages of development. (…). The IT sector is the best-developed market, with transactions between companies accounting for almost half of sales through the internet. (…) Approx. 57% of the companies of Poland claim to have a web site. So far, no more than 15% of these companies take advantage of e-commerce transactions (…).

Turkey: "(While) the Internet is well accepted as a communication information medium (…) B2B applications are very limited. E-commerce success stories involving care sales, hardware sales and on-line airline reservations are scarce in Turkey. (…) B2C sites are rare, but the investments are considerable. Large companies have realised the importance of e-commerce and offer their goods on the Internet (…)".

(US Department of Commerce, 2001)

However, other issues play also an essential role as potential obstacles to e-commerce development:

- Internal organisational factors may well be the biggest obstacle for taking the right decisions and overcoming organisational inertia: the right culture of enterpreneurship, e-business education, e-readiness and leadership are aspects to be dealt with.
- Limited use of banking products, possible lack of confidence of the consumers in the banking sector[71], and the generally still insufficient development of the financial services in most CC13.

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[70] PricewaterhouseCoopers (2000)

- The predominance of English language materials and the lack of Internet content in the local language.
- Mistrust in ICT based communication/transactions, which can be seen as potential tracing or profiling tools.

Focusing on customers[72], their lack of understanding of electronic commerce and lack of trust in these services are some of the important barriers to its development in the CC13. The lack of professional home delivery services and the negative perception of home shopping by customers[73], are other obstacles. This requires a special emphasis on gaining trust from consumers, by more accurately meeting their demands and decreasing the risk of fraud, and on the other hand strengthening the existing logistics and distribution systems.

In this field, only some champions exist in the CC13. Estonia clearly is one, as Estonian banks have more than 330 000 Internet bank customers, which puts it on a level with the highly developed Nordic countries.[74]

Also, the regional and bilateral co-operation of candidate countries with EU member states in many areas related to e-commerce is seen as facilitator of ICT take-up in the CC13. Europe-wide programmes are significant substitutes for the lack of financial means to speed-up the development at national level. Collaboration in Europe-wide projects and organisations facilitates decision-making for remaining technical and legal problems. It is expected that the joint efforts of European countries will create progressively an internationally compatible framework for e-commerce and facilitate national integration in a "virtual" economic area.

An essential observation of e-commerce impacts in various sectors of western industry is that, before generating major B2B or B2C developments, e-commerce first transforms progressively the internal co-ordination processes of companies, before slowly spreading out to some of the external processes such as those related to close suppliers and customers[75]. Additionally, these transformations are not only progressive and costly, but their outcome is also largely dependent on inherited industrial structures. In the very specific case of transition countries, it is the adaptation and the investment capacity of each industrial sector that will be challenged. In such circumstances, some of the take-overs of the last decade, as well as the volumes and assignments of Foreign Direct Investment, may also be seen as opportunities for faster modernisation.

Bearing these considerations in mind, it seems very ambitious to state that companies in the CC13 will rapidly be in a position to adopt and apply e-commerce technologies to leapfrog economic development and hence join the EU on a more competitive basis. Only the most economically advanced countries such as Estonia and possibly Slovenia may be in a position to successfully meet this ambitious challenge.

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[71] In some countries, consumers still remember the impacts of partial or total crisis of the banking sector on the national currency

[72] WITSA (2000)

[73] http://www.mac.doc.gov/eebic/countryr/hungary/research/Internet.html

[74] Siil, Imre (2001),

[75] Desruelle P. et al. (2001)

2.2 Main actors

The governments and the public administrations

The CC13 have great potential for a well-developed info-structure. In order to make the most of this potential it is of vital importance to build up a critical mass in investment and usage, and to create awareness of the profitability and prospective benefits of public and private partnerships. In this area in particular valuable lessons can be learnt from the EU experiences. This does not mean mimicking the Western European development procedures but adapting the lessons learnt.

As it is stressed for the EU 15 in the e-governance initiative[76], the role of governments in the building of an Information Society is of particular importance . Governments should be leaders rather than followers here, taking the initiative and actively promoting and encouraging the concept and building of an Information Society. Making savings at the wrong end and letting opportunities slip away during this crucial phase of development can prove a hindrance, not only to the IT sector, but to the development of the economy and society as a whole.

Box 14: Information society strategy – the Bulgarian case[77]

Bulgaria wants to actively develop information technologies and high-tech end-products as opposed to only import such products and services. The Strategy for Information Society Development in the Republic of Bulgaria (1999) and the National Program for the Development of the Information Society define the goals, the priorities and respective activities in this field.

Bulgaria's Information Society Strategy puts a special emphasis on the use of ICT in all areas of the economy, which should be guaranteed by a comprehensive legal framework, rules and procedures, a liberalised environment providing guarantees for the rights of the citizens and consumers. Equal access to modern, efficient and high-quality telecommunication and information services, including opportunities to acquire the appropriate skills, is one of the priorities of this strategy. SMEs are expected to play a key role in the creation of new jobs as well as for the market growth and diversity. The private sector in general is seen as the main actor in the consolidation of the market economy - all initiatives of the government are designed to stimulate it.

The focus of the current government programs is economic development within the context of the accession to the European Union. More effort, however, could be put on human development and creating measures to reduce "the digital divide" - in this sense, the government program could be more ambitious and forward looking.

National initiatives in favour of content-related IS developments

In the framework of EU accession negotiations and the EU/CEEC Information Society dialogue launched in 1995, a number of governmental initiatives (see Box 14) have been carried out in order to facilitate the transition towards an Information Society in CEE countries[78], for example:

- development of a national strategy or action plan for the Information Society
- setting up of a national co-ordination mechanism for the Information Society implementation and development

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[76] http //europa eu int/information_society/eeurope/egovconf/index_en.htm
[77] Inspired by: UNDP and Centre for the Study of Democracy (BG), 2001, Task force on IT for development, Issue paper
[78] EU/CEEC Joint high level committee (2000)

- introduction of a regulatory environment to facilitate the development of the Information Society, in particular special measures to mobilise the industry
- awareness raising actions on ICT use/impacts and on human capital formation.

The following table gives a brief list of some of the national IS strategies, as recorded in the ESIS database[79]. While focusing often on infrastructure issues, it is notable that the question of content provision, delivery and access is not always thoroughly tackled in those national plans.

Table 11: A brief view on some governmental initiatives related to the IS

Country	Policy documents
Bulgaria	1998: National Strategy for ICT education 1999: Strategy and National Program on IS development 1999: Program on application of advanced information and management technologies in the administration 1999: Strategy for development of High-Technology activities in Bulgaria 2000: National Programme on Electronic Commerce
Cyprus	1997 : Information Systems Strategy, computerisation of government bodies Government's Computerisation Plan Computerised Integrated Land Information System project
Czech Republic	May 1999 : State Information Policy, initial strategic document May 2000 : Action Plan for implementing the State Information Policy"
Estonia	"Principles of the Estonian Information Policy" Information Policy Action Plan
Hungary	2000 : "Hungarian Response to the challenges of Information Society"
Latvia	1996: National Concept for the development of Electronic Mass-Media 1998: Latvian Policy on the Telecommunications sector 1999: National Program Informatics 2000: "E-Latvia concept"
Lithuania	October 2000 : presentation by the Ministry of Public Administration Reforms and Local Authorities of a program on "Information Society in Lithuania" in line with European directives May 2000 : "Lithuania's Information Society Development Strategy March 2001: "Conceptual framework of the National Information Society Development of Lithuania" December 2001: "National strategy for information security technology"
Malta	April 2000 : the Government published its Policy for the Liberalisation for the Telecommunications Sector Information Systems Strategic Plan (ISSP) for 1999-2001 : plan to diffuse IT within governmental agencies
Poland	2000 : "Building Basis for Information Society in Poland", Parliament's resolution 2000 : "Aims and Directions of Information Society Development in Poland", prepared by the KBN and Ministry of Communications
Romania	2000 : National Medium term Development Strategy of the Romanian Economy 1999 : adoption by the government of the National Research, Development and Innovation Programme (RDI)
Slovakia	2000 : State Telecommunication Policy for 2000 - 2002
Slovenia	2001: Action plan e-Slovenia 2001: Action plan e-Government 2001: Strategy of electronic commerce in public administration 2001-2004
Turkey	2000 : Approbation by the Parliament of the 5-years Plan

Based on ESIS, 2000

The process can be seen as one of "capacity building". In the CC13 it involves establishing and developing internally new institutions. Capacity building also involves providing a regulatory 'tool kit', the acquisition of skills in the use of the tool kit and, most importantly, establishing the credibility of the regulator. Front-end expenditures on these activities are expected to produce significant long-term benefits.

A pan-European Action Plan: eEUROPE+

At the European Ministerial Conference held in Warsaw in May 2000, Central and Eastern European Countries recognised the strategic goal set by the EU-15 in Lisbon. This strategic goal sets for Europe to become "the most competitive and dynamic knowledge-based economy in the world" by 2010. It underlines the urgent need for Europe to exploit the opportunities of the knowledge-based economy and in particular the Internet. The Warsaw Conference embraced the challenge set by the EU15 with eEurope and decided to launch an eEurope+ Action Plan[80], as a compliment to the EU political commitments, to be carried out by the Candidate Countries for their own benefit. In February 2001, the European Commission invited Cyprus, Malta and Turkey to join the other candidate countries in defining this common Action Plan.

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[79] ESIS: European Survey of Information Society. An Information Society Project Office (European Commission) initiative accessible on the web at http://europa.eu.int/ISPO/esis/default.htm. The ultimate update of the database is dated end 2000.

eEurope+, mirrors the priority objectives and targets of eEurope but provides for actions which tackle the specific situation of the Candidate Countries. Like the eEurope action plan, the eEurope+ Action Plan aims to accelerate reform and modernisation of the economies in CC13, encourage capacity and institution building, improve overall competitiveness and provide for actions which address the specific situation of the Candidate Countries.

Its third set of objectives gives clear guidance for the development of an info-structure that supports content supply, delivery and consumption. The major headings of the third chapter, devoted to "stimulating the use of the Internet", are the following: Accelerating e-commerce; Government on-line: electronic access to public services; Health on-line; European digital content for global networks; Intelligent transport systems; Environment on-line. As such, they perfectly match the objective of supporting the emergence of a solid info-structure in the CEEC13.

Box 15: The case of public access centres to on-line content

In *Latvia* NGOs support centres have been set up in 13 cities providing free of charge access to the Internet and use of computers. Most employees of these centres provide also consultations. Libraries also are becoming important and modern centres for seeking and obtaining information. However, the development of libraries is hindered by the lack of convenient Internet connection.[81]

The first *Hungarian*[82] telecottage has been established in 1994 in a small village of 1200 inhabitants. Maintaining the network of these types of service units is a common interest shared by local residents and their small communities, the local government, and regional-, national-, or international organisations that aim to reach the residents of small villages with their services and opportunities. In 1999, the incorporation of telecottages as general public administration and public service organisation network access points began as part of the government's Public Administration Development program.

In the *Czech Republic*, information boxes have been installed at labour offices and at welfare support workplaces. At present they do not have access to the Internet. It is considered as a follow-up to the public administration reform, more information kiosks to be installed at accessible locations, e.g. the networks of some libraries, district or municipal offices, etc.

A role for public access centres

It is often said that access to communications and to on-line content, should, in an Information Society, be assimilated as a basic human right[83]. Therefore, the establishment of public gateways to electronic information and services is seen as important as it provides all citizens with equal access at affordable prices. Access to on-line services in a social location, different from work or home, has been provided in the

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[80] at http://europa.eu.int/information_society/international/candidate_countries/index_en.htm
[81] UNDP (1999)
[82] the Czech Republic and Hungarian reports in EU/CEEC Joint high level committee (2000)
[83] ITU (1998)

CC13 in various forms, e.g. information kiosks, stand-alone terminals, telecentres, community centres, clubs, etc.[84]. The centres in rural areas also fulfil some intermediate functions related to technological assistance to users and consultations and have particular importance for bridging the regional digital divide (see Box 15).

The content industry

Much of the innovative activity for on-line content in the CC13 appears to come alternatively from public bodies and from small local firms. The emerging 'cyber-firms' explore e-commerce opportunities in the services sector. At the same time local companies are developing knowledge-intensive business and consultancy services, and focus on the provision of electronic access to information to the general public. The growth of Internet content and web portals in the CC13, however, is supported by trends of consolidation and building strategic alliances up and down the value chain. Through such partnerships, both first and second-tier players, are obtaining the opportunity for more revenues than they do from server and applications hosting, e-commerce solutions and design. The market growth and the round of consolidation taking place in the ISP business in CC13 is likely to be repeated in portals and content following the processes witnessed in Western Europe and the US[85].

The traditional content industry (e.g. audio-visual, electronic media, publishing, etc.) has experienced rapid growth during the transitional period, following phases of high fragmentation and subsequent mergers and acquisitions by foreign companies. The emergence of private media channels has increased the challenges to public service broadcasters and has introduced competition for access to finance through sponsorship and advertisement, and acquiring of exclusive rights for important events. However, economic factors also influence the growth of the media industry in candidate countries: larger markets are more attractive for foreign investors and generate relatively high volumes of spending on advertisement, while underdeveloped or smaller economies are not capable of ensuring sustainable media growth and financial sources[86].

The new communication markets, the convergence of media, telecommunication and informatics sectors, and the new consumers environment are part of the changes that can be seen in the emerging information society. Together with the growing number of cross-promoted products, the convergence of technological platforms generates a progressive blurring of the former categories of actors in the media industry and beyond.

In the next few years the CC13 will experience a development from 'mass information media', offering 'centralised TV for all' and financed through licensing fees and advertisements, towards pay-TV, thematic channels with tribes of viewers, paying directly tailored services. Although at present interactive broadcasting services, for example pay per view and video on demand, are not being developed, the development of two-way communication channels i.e. in cable and satellite TV networks will speed-up the process of individualisation and more active consumption of broadcasting services. It will also change the economy of the audio-visual sector and in particular marketing strategy and consumers relations.

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[84] Council of Europe (2000)
[85] Issaeva et al., (2001)
[86] UNESCO (2000b)

The business players

As in most European countries, the spread of ICTs among companies in the CC13 is a market-driven phenomenon. Most of the companies still see no real strategic reason to go on-line[87]. It is still little more than an extra or a question of image. Few companies are acting on their own initiative – even the most forward-thinking have only recently started to implement e-business strategies (see Table 12). ICTs are still not perceived as contributing to competitive advantage, even not as an integrated tool for viable business.

Table 12: Competitiveness indicators in Internet

	Note	BG	CZ	DE	GR	HU	PL	RU	SK	TU
E-mail	rank	55	16	21	51	40	54	56	53	22
Does your company use e-mail?	1=strongly disagree 7=strongly agree	5.48	6.9	6.8	6.3	6.5	5.5	4.9	5.8	6.8
Internet for information	rank	56	9	16	32	42	29	57	54	20
Share of companies that use Internet for general information	%	83.9	100	100	98.2	97	98.5	83.9	87.1	100
In ternet for supplier relations	rank	56	29	12	50	54	30	44	13	40
Share of companies that use Internet for supplier relations	%	47.1	68.4	75.9	54.9	49.4	67.3	59.6	75	61.8
Internet for customer service	rank	57	20	10	48	55	40	59	21	44
Share of companies that use Internet for customer service	%	37.1	81	84.1	63	45.7	70.7	33.3	80	67.6
E-commerce	rank	58	31	5	54	53	15	55	9	42
Share of companies that use Internet for E-commerce	%	12.8	45	67.5	24.4	24.7	55.3	22.5	62.3	39.4

Source: Centre for economic development[88], 2000, quoted World economic forum

Box 16: Culture of enterpreneurship: Turkey?[89]

"While the Internet service provider market is quite dynamic, there are so far very few examples in Turkey of Internet-related activities that are involved in the creation of distinctly new products or services reflecting strong innovative activity. One possible explanation for this is what appears to be a rather low culture of enterpreneurship. (...). In Turkey the start-up life cycle typically gets short-circuited. First, there are very few success stories along these lines in Turkey, so a young person sees little in his or her experience to inspire him/her to start a new company. Second, some have indicated that as a whole Turks do not have a risk-taking mentality in which failure is an acceptable outcome. Third, there is little venture capital to fund start-ups. Given the inflation rate and the enormous debt the Turkish government carries, the interest rates on government securities are quite high. Money in Turkey is more likely to be attracted to well-paying, safe investments than to highly speculative ventures. Fourth, it is virtually impossible to survive as a software company in Turkey. Software piracy is rampant."

As already said earlier, investment capacity, especially domestic investment, is still relatively weak, and risk-taking options are usually left aside in such circumstances (see Box 16). Close observation of foreign direct investment in some strategic industries and businesses could help forecast the trend for forthcoming years. On the other hand, the volatility of the (Western) digital market and the recent collapse of the Internet bubble will make new investments more prudent.

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[87] Eade Ph. et al. (2000)

[88] http://www.ced.bg

[89] Quoted from: Wolcott P.(1999); see also P. Wolcott et al. (2000)

Additionally, the conservative attitude of most customers, and some businesses, to the so-called *new economy*, the lack of trust in security of technologies and the fear of misuse of personal and business information further influence companies investment and adoption of ICT-based strategic options.

There are expectations that with increased competition, companies will reconsider e-business alternatives for higher efficiency and competitive advantage. Multi-nationals which establish branches in CC13 increasingly require e-business capacity of their suppliers and the banking sector. They bring in e-business models, forcing both their partners and competitors to respond: it is the fear of falling into obsolescence that is apparently driving most of the e-business in the CC13 [90].

A tentative assessment of national e-readiness

The assessment of global e-readiness carried out by McConnell International in August 2000 considers Central and Southern Europe as "a most e-ready region"[91]. In particular, the report says that the highly skilled population and reasonable information security in these countries considerably reduce e-business risks. Nonetheless, in many countries substantial room remains for improvement in the e-business climate, especially the regulatory environment (see Table 13).

Table 13: Assessment of e-readiness in Central and Southern Europe

Country	Connectivity	E-leadership	Information security	Human capital	E-business climate
Bulgaria	1+	2	1-	2	1+
Czech Rep.	2+	2	2	2	1+
Estonia	2+	3	2	3	3
Greece	2	1+	2	2	1
Hungary	2+	2-	2	3	2
Italy	2+	2	3	2+	2
Latvia	1+	1+	2	2+	2+
Lithuania	2	2	2	2	2
Poland	1+	2	2	2+	2
Portugal	2+	3	2+	2	2+
Romania	1	2	1	2	1+
Russia	1	1	1	2-	1
Slovakia	2	1+	2+	2	1+
Slovenia	2+	2+	2	2	1+
Spain	2+	2+	2+	2+	2+
Turkey	2	2	1+	2+	2

Source: McConnell International, 2000

+/- indicates improvements/weakening relative to prior time periods

1 - substantial improvement needed to the conditions necessary to support e-business and e-government

2 - improvement needed to the conditions necessary to support e-business and e-government

3 - the majority of conditions are suitable to the conduct of e-business and e-government

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[90] Makro's biggest problem in the Czech Republic is the logistics. Most of his largest suppliers are using standard electronic data interchange links to process orders. When switching to an Internet-based system there are expectations that 90% of its suppliers will be soon on-line. Eade Ph. et al. (2000)

[91] The E-Readiness ratings combine a dynamic evaluation of the relevance and accuracy of available quantitative data with an understanding of cultural, institutional, and historical factors relevant to the actual situation in each country. The ratings measure status and progress on five interrelated attributes: Connectivity, E-Leadership, Information Security, Human Capital, E-Business Climate, see Risk e-business: Seizing the opportunity for global e-readiness, http://www.mcconnellinternational.com

E-Leadership, related to the scope and nature of government and industry efforts to promote the networked world, is assessed as relatively strong. Estonia and Portugal have the highest rating, while Greece, Latvia, Russia and Slovakia need significant improvements. Estonia provides a strong example of the E-Readiness success that can be achieved with government leadership.

2.3 Challenges

Exploiting the full potential of digital content

Affordability of quality content: The advent of digital broadcasting platforms will raise several new issues for the CC13 related to the protection of consumers' and citizens' rights. The trend of content migration to pay-TV and premium channels is raising the issue of the availability of quality content in an overall context of lower than average per capita revenues. Subsequently, there is a need to ensure that all three digital platforms (terrestrial, cable, and satellite) achieve maximum geographical coverage to enhance competition and viewer's choice, and lower prices. Affordability, as part of market acceptance, is also a major issue for the financial sustainability of the entire sector.

Accessibility of the cultural heritage: The CC13 have the opportunity to enrich European culture with their national traditions and heritage and contribute to sustainable cultural development. However, the promotion of cultural diversity on the Internet and the access to world cultural heritage via the new electronic media is likely to require the joint efforts of the international community in developing the necessary technological tools to offer linguistic diversity (including in other alphabets) and avoid the often cited trap of world-wide Americanisation of cultures.

Protection against illegal and harmful content: The transfer of illegal and harmful content is another feared implication of the Internet. In the context of some of CC13, very specific attention has to be paid to such aspects as traffic of human beings and minors, traffic of arms, black market practices, corruption and money laundering. However, such surveillance option is an essential global challenge to ethnic, religious and minority rights, human dignity, constitutional freedoms of association, speech, information, etc. Thus, self-regulation options, if acceptable, will require clear legal frameworks and the involvement of all stakeholders. Bearing in mind that technological solutions like encryption, rating and filtering systems, profiling, rights management systems, techniques of anonymity, pseudonimity and virtual identity, etc. could be used for both good and ill, there is clear need for well balanced regulatory and self-regulatory rules.

e-Governance: The public sector is one of the biggest content providers around Europe. In the CC13, state institutions seem to be going on-line rapidly, giving people access to large data bases and information sources. However, offering public information will not be enough. A major challenge of the next decade will be to find ways of governance which offer new tools for managing the public sphere democratically. On-line voting procedures, e-procurement, political information and open on-line debates are lively facets of the information society which CC13 still have to experience and adapt to their own circumstances. There will be also be room here for NGOs, minorities, and political parties. Each country could embrace this opportunity for reinforcing its democratic foundations, whilst at the same time pushing the development of an IS.

Changing media landscape: The media are essential content producers in all CC13 and can offer guarantees of pluralism and diversity of interests. They are and will be strongly challenged by the technical innovations in the field of ICTs on the one hand, and the globalisation processes on the other. It will be essential to keep these media from simply collapsing during the process.

Networks and Partnerships: The development of networks and partnerships both on a national and inter-regional level, with the aim of creating critical mass in terms of market size and community size, is an important and yet rarely addressed opportunity for creating large scale demand and supply. It is more likely that there are common interests within the CC13 (and adjacent MS) than between the CC13 and core European countries, which underlines the importance of regional co-operation beyond national borders in this region.

Creating the right e-business context

Competitiveness of enterprises: The future competitiveness of enterprises may depend on fast access to up-to-date information, electronic communication with partners and customers, innovative marketing strategy and the use of own web page and data base references in high rated sites. More attention also needs to be paid to B2B transactions as a prime facilitator of economic growth. The CC13 as producer countries, as opposed to consumer countries, is the key here and a fundamental attribute for a competitive industry.

An efficient logistics system: ICTs give access to new markets and opportunities, they open up possibilities for small firms to access the needs of global conglomerates. However, this has to be managed, structured and supported on the solid foundation of an efficient logistics system. In this regard, the development of the postal services, for example, is an often under-rated and rarely addressed issue.

Competitiveness beyond national borders: There is a real opportunity to create markets beyond national borders. Regional databanks with local data are but one of the commodities which could sustain cross border competitiveness.

Protection of data and intellectual property: As well as offering new opportunities for education, healthcare and democratic participation in public life, ICTs provide powerful tools for control of private behaviour and information and facilitate the infringement of intellectual property rights. The piracy of audio-visual products and computer programmes could inflict serious losses on the economy and diminish local markets. Similarly, the illegal collection of personal data and disclosure of private information could have serious consequences for the personal lives of individuals. The need for a number of actions for the protection of intellectual property rights and privacy in the CC13 is obvious.

Balanced deregulation: The foundation for a competitive environment is the creation of an economy that is sufficiently stable and regulated to attract investment and promote enterpreneurship, but at the same time liberal and open enough for companies to explore their objectives with enough freedom to create a profitable business.

New working organisations: Candidate countries still have a long way to go to meet the objectives of e-business. The Information Society requires radical changes in behaviour and organisation in enterprises (as well as in the public sector). It implies a transformation of attitude and working methods. Horizontal approaches may replace the classic hierarchical pattern of administrative and business structures, and require more flexibility in working environments.

SMEs: More attention needs to be paid to small and medium sized enterprises in the supply chain of large companies, and to SMEs with their own small production occupying small market-niches (producers, manufacturers, retailers). The lack of appropriate technologies, skills, technical and management personnel, as well as awareness of the potential advantages of ICTs may hamper their competitiveness and survival in the market.

Building Credibility: For all of the above to have an impact on the status quo, it is vital to promote trust and confidence in the technologies which form the basis of a knowledge-based society. Building the credibility of the telecommunications regulator, not only the technologies themselves, is another challenge in this field that may produce external benefits for other necessary institutions.

Chapter 3
Capabilities and skills

The high speed of change in technology and the trends towards a knowledge-based economy have created a robust demand for highly skilled workers able to create, apply and use technology. The availability of human resources with the required knowledge and skills is a determining factor in the prospects of economic development and competitiveness in a particular country. A critical mass of skilled labour is needed to supply ICT applications, provide support and disseminate relevant technical knowledge. Digital literacy and awareness of the implications of ICTs and their opportunities are necessary conditions for the development and use of new electronic services for entertainment, business and work. New managers are in urgent need of new skills and knowledge for better management and communication with customers and partners[92].

3.1 ICT based trends in the educational systems of CC13

During the transitional period, the educational systems in CEEC10 faced the challenges of providing education needed for the digital age while massive economic and social changes were going on. The reform focused on preserving as far as possible the public education achievements of the past while introducing new management, new educational curricula and materials. Due to the large economic decline, state support for education has been seriously reduced in real terms. In 1996 real expenditures on education, compared to the 1990 level, have fallen in Hungary to 78%, in Slovakia – 69%, Latvia – 55% and in Bulgaria – 25%.[93]

The insufficient financial resources of the state have resulted in prioritising and streamlining more resources in secondary education in many candidate countries (see Figure 6). This made it possible to maintain a good level of student knowledge in mathematics and science in some countries[94] and to preserve the existing level in these areas. For other countries, like Poland, Romania and Turkey, the emphasis on primary education is likely to respond to the more complex problems of providing equal education opportunities to people living in rural areas. Besides, in Turkey the growing number of children accentuates the challenge, while other CC13 are faced with the challenge of demographic decline of the school-age population.

The transition to a more decentralised educational system in the CEEC10 has contributed to regional disparities in the provision of education and training, and generally to increasing polarisation in educational opportunities for students with different backgrounds[95]. Children from ethnic minorities or other disadvantaged groups have fewer opportunities to access quality education, their drop-out rates are also higher. On the other hand, the emergence of private educational institutions and a need for additional paid classes in order to pass the entry exams in many upper-secondary schools have contributed to building elite streams of education and thus further increasing the divide in the society.[96] Thus, many people in CC13 find themselves in a kind of vicious circle:

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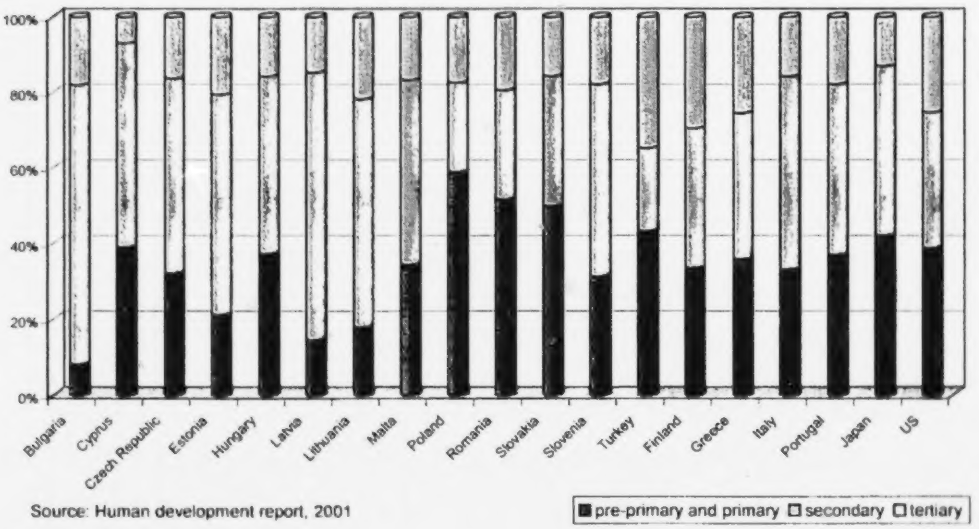
[92] Ducatel et al. (1999a,b)
[93] UNESCO (2000a)
[94] OECD (2001a)
[95] Gourova et al., p. 63
[96] UNESCO (2000); Micklewright (2000)

having low incomes, they are not able to get better education, and without a good skills level they are not able to get a better-paid job to pay for the education of their children. More worrying is the fact that the existing educational divide is likely to be further aggravated by the introduction of ICTs in education and the unequal opportunities of different regions and social groups.

Figure 6: Public educational expenditure 1995-97 (as % of all levels)



Source: Human development report, 2001

Introduction of ICT in education

Despite the growing disparities in education and the problems encountered at regional level, the introduction of ICTs has now become an important educational topic and lies at the heart of national policies of CC13. This trend is unquestionably linked to the development of the Internet and the use of various communication tools and information resources in everyday life and work, as well as the recognition of ICTs as a global necessity. E-learning is gaining momentum, driven also by a recognition of the shortcomings of traditional training delivery methods and the pervasive Internet technology which has created dynamic and innovative alternatives in terms of both access and content.

Along with the acknowledgement of the role of ICTs as enabling technology and a necessity for all, candidate countries differ in the goals they put in ICT education policies. Most of them focus primarily on ICT education as a separate subject, while the use of ICT as a tool to carry out interdisciplinary projects is the most widespread approach of EU countries. The objectives pursued by CC13 cover a wide range of fields: programming, use of software, information searches and communication via a network (Bulgaria, Romania, Slovenia) or aim at familiarising pupils with ICT (Hungary) and enabling them to acquire basic knowledge (Poland, Estonia).[97] The Bulgarian ICT strategy,[98] for example, has wider goals for ICT education, which go beyond computer literacy, and focus on the development of skills necessary for the personal, professional and social life of every individual. It also takes into account the needs of the educational process for experienced teachers and the needs of the economy for ICT specialists, having in mind also the national strengths in this area.

Table 14: Objectives of selected ICT educational projects at primary and secondary level

	BG	EE	LV	LT	HU	PL	RO	SL	CY
Project objectives	**Primary education**								
Equipment (availability, renewal, accessibility, etc.)		x	(-)	(-)	x	(-)	x	x	x
Acquisition and/or distribution of software	x	x	(-)	(-)	x	(-)	x	x	x
Development of teachers' skills	x	x	(-)	(-)	x	(-)	x	x	x
Development of pupils' skills	x	x	(-)	(-)	x	(-)	x	x	x
Help in development of software/ educational software		x	(-)	(-)	x	(-)		x	x
Use of the Internet	x	x	(-)	(-)	x	(-)	x	x	x
	Lower-secondary education								
Equipment (availability, renewal, accessibility, etc.)		x	x	x	x	x	x	x	(-)
Acquisition and/or distribution of software		x	x	x	x	x	x	x	(-)
Development of teachers' skills	x	x	x	x	x	x	x	x	(-)
Development of pupils' skills	x	x	x	x	x		x	x	(-)
Help in development of software/ educational software		x	x	x	x			x	(-)
Use of the Internet		x	x		x	x	x	x	(-)
	Upper-secondary education								
Equipment (availability, renewal, accessibility, etc.)	x	x	x	x	x	x	x	x	x
Acquisition and/or distribution of software	x	x	x	x	x	x	x	x	x
Development of teachers' skills	x	x	x	x	x	x	x	x	x
Development of pupils' skills	x	x	x	x	x		x	x	x
Help in development of software/ educational software	x	x	x	x	x			x	x
Use of the Internet	x	x	x	x	x	x	x	x	x

Source: Eurostat (2000a), (–): No national project on the use of ICT at this level of education

In all candidate countries community-wide projects and various national initiatives have been launched, aimed at the introduction of ICTs into all educational levels. Co-operation alliances among public authorities (central or local), NGOs, companies and educational institutions have fostered the achievement of common goals in education. NGOs like the Tiger Leap Foundation in Estonia, the John von Neuman Computer Society in Hungary, the Stefan Batory Foundation in Poland, etc. have taken the lead in nation-wide educational initiatives. In the initial stages, secondary education has gained more attention, and projects at all three levels started after 1995 in most CC13. The most long-standing initiatives were launched after 1985 in Bulgaria, Lithuania and Cyprus focusing on the upper secondary level. In Romania and Slovakia, a project for the three levels of education has been launched in 1999[99]. The goals of most ICT projects in education relate to the purchasing or renewal of equipment; the acquisition and construction of software; the skills of teachers and pupils and the use of the Internet (see Table 14).

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[97] EURYDICE (2000)

[98] Ministry of education and science, Bulgaria (1998)

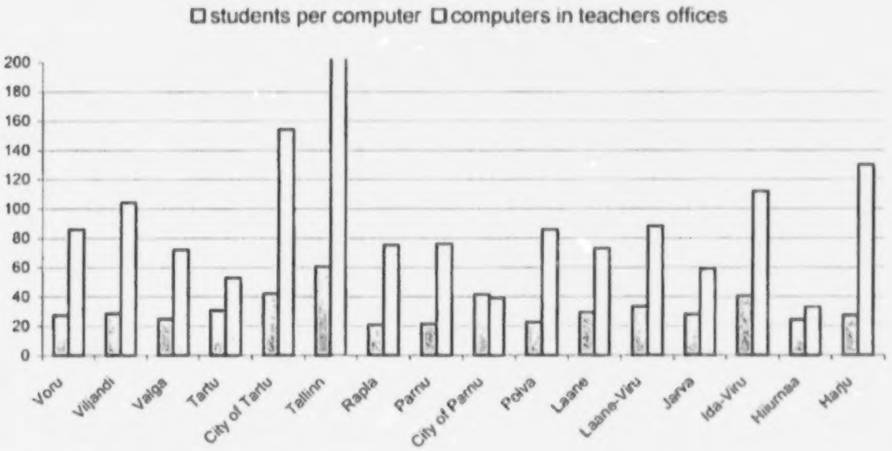
[99] Eurostat (2000a)

The initial emphasis in CC13 on building computer networks and provision of IT equipment in schools corresponds to the trend in OECD countries, where few resources are spent on software and only around 5% on teachers training[100]. However, this trend needs to be assessed carefully, bearing in mind that the technologies are just instruments, and it is the people that put life and motion into them. A challenge for the years to come is to mobilise complementary investments in human capital in education and to focus more on human-technology interface imbalances.

New equipment and educational materials

The availability of computers and their connection to the Internet are essential for the ICT-based learning process. Unfortunately, national statistical data regarding the purchase and maintenance of ICT equipment or the ICT budget are not always available and where available are hard to compare. The shared responsibilities for the purchase and maintenance of equipment, the decentralisation of education and establishment of many private schools make it very difficult to obtain such information. As noted above, awareness and willingness to provide Internet connections for schools is present in all CC13. However, they differ significantly in the approaches followed for supplying ICT equipment and networking of schools (see Box 17).

Figure 7: Computer penetration in Estonian counties



Source: Tiger Leap Foundation (2000)

As a result of the diverse initiatives and financial opportunities there are large differences in CC13 in the acquisition of ICTs by schools and their use by students. In Estonia, for example, the different contribution of the municipalities in addition to the Tiger Leap foundation assistance has introduced large differences in the number of computers available for students and teachers across the country (see Figure 7). Besides, the speed of

[100] OECD (2001b)

Internet connections varies significantly between schools in Estonia - from 1 Kbps (2%) to 2Mbps (8%), whereas most schools are connected at rate 128 Kbps (34%) or 64 Kbps (37%).

Box 17: Networking of schools

Estonia has made significant commitment in the last few years to developing ICTs in education. While the initial focus was on general education, the emphasis today reaches all educational levels. In 1996 has been launched a national school computerisation programme, known as 'Tiger Leap', with the goal of modernising the educational system, creating the conditions for an open learning environment and better adaptation to the demands of the IS. One of the objectives was to connect all schools to the Internet by the year 2000. Although some difficulties have been encountered (partly due to the shared responsibility), OECD data show that by 1999 more than one-fifth of the schools have been connected to the Internet and half of them having e-mail[101].

In *Lithuania*, in 1996-1997 a national school computerisation program was realised. In 1999 new program E-school was launched aimed at providing Internet access for all students and teachers in 2003. In 2001 33% of schools were connected to the network and 20% had high-speed Internet links.[102]

In *Poland* two successive projects – Internet for Schools (1995-1998) and Internet classroom in each commune (1998 - 2000) – have provided Internet access for more than 6500 schools, computer equipment and educational software. Appropriate training for teachers has been also provided. The second project, carried out in two phases, was considered as a pilot project and part of the future National strategy of education for the information society, which is being prepared by the Ministry of National Education.[103]

In *Bulgaria*, in 1999 a Program was elaborated for development of the National education and research network until 2001. The goal was to achieve full use of the Network resources in the educational process of higher and secondary schools by the end of 2001. However, the lack of resources is considered as a bottleneck in networking of schools and implementing of this program. Higher results are achieved within the School on-line initiative[104] involving private and public actors in a project aimed at excellence in IT knowledge. In the first phase in 2000, in selected schools with excellent achievements in mathematics, informatics and physics computer laboratories were supplied with high speed Internet links and advanced information technology. In addition, a special centre has been established for training of teachers, in particular informatics teachers.

While in Estonia more than 77% of the students access the Internet in school, in Slovakia computers are available to secondary school students predominantly in their homes, whereas the acquisition of communication technologies is markedly dependent on the education level of the parents. According to a survey of the Bratislava's National Center of Media Communication, only 10.9% households of the respondents with basic education have a PC, whereas the corresponding figure for respondents with tertiary education is as high as 49.5%. Internet access is available to 0.7% and 13.4% respondents with basic and tertiary education, respectively[105].

In Hungary all secondary schools are connected to the Internet and, as a result of the project School-Net launched in 1996, many schools have been equipped with computer laboratories incorporating 6 to 18 multimedia computers per laboratory.[106] There are on average 30.11 students per PC in primary schools, 17.72 in secondary grammar school, 13.98 in secondary vocational school and 28.92 in vocational training schools[107]. In Latvia the ratio of students per computer has decreased two times in the period 1997-

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[101] OECD (2000), p.47

[102] Input has been provided by Dr. Antanas Cenys, Lithuania, see also http://www.smm.lt

[103] EU/CEEC Joint high level committee (2000)

[104] http://www.schoolsonline.org/whatwedo/bulgaria.htm

[105] UNDP (2000b), p.34

[106] UNESCO (2000b)

[107] OECD (2001c), http://waldorf.eds.udel.edu/oecd/report/cases/HU/BerzeNagy/HU05.html

2000, reaching 32.3 students per computer in 2000. In this country 20% of the secondary schools in rural areas and 49% in the cities have permanent connection to the Internet with a speed of more than 128 kbit/s , and 97% of all schools have dial-up connection[108]. With 66.4 students per computer, Bulgaria is far behind Hungary and Latvia. However, there are big differences within the districts in the country – reaching from 220.8 to 19.2 students per high-class computer. It is interesting to note that the computer equipment of schools is not related to the overall development trends in the region – the Montana district, situated in the less developed North-West region, has higher computer penetration per students[109]. Similarly, the data for computers in higher schools and universities (Table 15) show that the private American University in Blagoevgrad has almost 1 computer per student, while others have as many as 120 students per computer.

Table 15: Penetration of computers in higher education institutes in Bulgaria

Education establishment	Departments	Professors	Students	Computers
I. State universities and higher-schools				
Sofia University "St. Kliment Ohridski"	8	1 848	30 289	3500
University of Shumen "Konstantin Preslavski"	4	496*	7300	250
South-West university "Neofit Rilski", Blagoevgrad	7	255*	12 446	206
University of Russe "Angel Kantchev"	7	488	6 476	720
University "Prof. Assen Zlatarov" - Burgas	3	324*	2 827	230
Technical University, Sofia	11	1 300*	13 560	1800
University of Forestry - Sofia	5	257	2 960	300
University of chemical technology and metallurgy – Sofia	3	384*	3 491	412
University of economics – Varna	4	278*	8 733	470
Academy of economics "Dimitar Tzenov" – Svistov	4	245*	9 422	450
Agricultural University - Plovdiv	5	216	2 377	248
Trakia University – Stara Zagora	3	502*	2 452	450
II. Private universities				
American University - Blagoevgrad	3 academic trends	59	700	550
* The total number of professors includes also the professors in the branches and colleges included in the structure of the respective higher school				

Source: Vitosha research (2001)

In general, the development of new multimedia content has not gained sufficient attention. Even where technologies and skills are available, the integration of ICTs in the learning process is hampered by the lack of appropriate electronic books or multimedia tools in the local language. The dominance of the English (the 'lingua franca' of the information age) is often considered as a big barrier for the enhanced usage of ICTs in CC13. The language barriers are recognised at policy levels, however the limited size of the local markets is often not able to attract international corporations to develop professional language tools. Subsequently, a local company is trying to solve language problems in all three Baltic countries and to provide them the possibilities supplied in the major languages[110].

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[108] Bicevskis et al. (2001); see also http://www.liis.lv/english/main.htm
[109] Vitosha research (2001), p. 31

In all CC13 could be found on the web multimedia educational materials in a digital form and announcements for various distance education and training opportunities. As already pointed out in Chapter 2, many libraries provide on-line access to books, journals, catalogues, facilitating thus the access to information sources from the work place or home, while web portals facilitate the search for available educational content in local languages on the web. The emphasis of CC13 governments on the usage of multimedia tools in the educational process in eEurope+ Action plan, might speed-up the development of high-quality content (see Box 18). The collaboration of all actors – teaching staff, software developers, content producers, learning content distributors, etc. - might facilitate the development of high-quality educational materials that meet the e-Learning demands.

Box 18: Multimedia educational materials

In *Hungary*[111] the Ministry of Culture and Education invited tenders for multimedia materials that are interdisciplinary in character make use of recent scientific achievements and can be processed within the framework of a single 45-minute class. Subject areas of the content development included Multimedia Starters' Kit. Internet Starters' Kit. educational materials following the subject areas of the Hungarian National Curriculum. interdisciplinary materials for individual study. in the field of music, etc.

The educational materials were generally accessible on the Internet. while access to others were limited to those primary and secondary schools and institutions of education which actually took part in a certain program. Recently the priorities of the program has changed, greater emphasis will be placed upon content development, and on developing an educational on-line information site. A team of editors will be set up, each of them will be responsible for their own subject areas.

In 1997-2000 within the *Latvian Education Informatization System* (LIIS)[112] project teaching aids that correspond to all types of cognition - rational cognition (e.g.. mathematics). empirical cognition (e.g.physics). emotional cognition (e.g., literature), cognition by modelling (e.g.. informatics) were developed. University staff, teachers. students. scientists have been involved in the process of creation of educational courses, educational software, multi-language specialized dictionaries. www-pages containing projects for independent investigations of students, problem books for talented students. tests and interactive databases. With the development of educational content the LIIS project has contributed to substantial reduction of the lack of teaching aids for high schools in main subjects. especially in rural area. a great problem in 1997. A further work is planed to focus on the process of introduction of new general educational standards. developing corresponding methodical materials and involving broad educational community into their improvement and discussions.

ICTs offer new opportunities for content delivery, text navigation and visualisation. However, earlier technologies continue to play a crucial role in education world-wide[113]. The patterns of consumption in all sectors show that ICTs are going to be complementary tools providing additional opportunities and normally saving time and resources. In any case, their role in working and social life is continuously increasing and requires the respective response by human beings.

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[110] Vasiljevs et al. (2000); Emst&Young (1999), p.31; .
[111] EU/CEEC Joint high level committee (2000): Hungarian report
[112] http://www.liis.lv/english/main.htm
[113] UNESCO (2000b), p.45

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The human factors in the e-Learning process

While at the policy level it is clear that schools should be wired, the ability of teachers to adapt effectively to new technologies in the learning environment is somewhat questionable. On the other hand, the quality of the education provided represents a significant factor that affects the quality of life for the young generation and is strongly dependent on the qualification level and expertise of teachers. Therefore, all candidate countries recognise the need for training and retraining of teachers as a crucial issue for the implementation of the e-Learning concept. They differ slightly in their requirements for the teachers' qualifications (see Box 19).

Box 19: ICT training of teachers

In a majority of countries at primary and lower-secondary level specially trained teachers might *teach ICT as a separate subject*, while at upper secondary level the initial training of ICT teachers is generally provided at university level. At primary level, there are specialist teachers for the subject ICT in Estonia, Hungary, Poland and Romania.

For *general class teachers or specialist teachers in other subjects*, training in ICT is optional for teachers at primary level in some candidate countries (Bulgaria, Estonia, Hungary, Romania and Slovenia) and forms an integral part of compulsory courses for teachers in Latvia and Cyprus. For teachers at secondary level ICT training is compulsory in the Czech Republic and Latvia, and optional in Estonia, Hungary, Romania and Slovenia. In Lithuania, Poland and Slovakia, the universities decide whether this course is compulsory or optional for initial teacher training.

All countries that train their teachers in the new technologies have defined policies on *in-service training* in this field. In Latvia and Poland, updating ICT skills is part of an official plan but it is not a priority, while Bulgaria, the Czech Republic, Estonia, Romania and Cyprus do not have official plans in this area. At secondary level, in-service training in ICT is compulsory in Bulgaria and Latvia, but only for those teachers who specialise in technology. The same applies to specialist teachers at upper secondary level in Cyprus.

(Eurostat, 2000a)

The question of teachers' ability to respond to e-Learning calls for a closer look at the present state in CC13. In general, the teaching profession is characterised in most CC13 by feminisation and gradually ageing of educational staff. The low interest of young people in teaching as a career is mainly due to its low status and wages. The demand for high-skilled teachers is particularly acute in rural areas. On the other hand, there are many concerns that the lack of new teaching methodology at universities and any significant changes in teaching principles and university study programmes might further slow down the educational changes[114].

Many training programmes in CC13 have the objective to retrain teachers and prepare them for the changing learning environment. Foundations, teachers organisations, consortia of schools building a regional or national training networks, as well as national educational or labour authorities are often involved in the process of training of trainers. In Latvia, for example, within the project Latvian Education Informatisation System (LIIS), a lifelong education system for training all teachers in applying IT in their work has been developed. In Latvia's regional centres more than half the teachers had acquired computer skills by 2001[115].

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[114] for example in Latvia according to the UNDP (1999)

Cultural and psychological changes are also needed – to motivate teachers to use ICTs efficiently and to move towards a more open learning process and self-development on-the-job.

The general acceptance of the need to apply and use new technologies is widely recognised as a crucial issue for the further diffusion of technologies and the respective changes in patterns of work, life and learning. It is not a problem of CC13 only that non-ICT teachers often oppose the mediator role of machines in human communications and refuse to implement ICTs. Some teachers believe that the use of word processing results in underdeveloped motor skills due to the lack of handwriting practice, and also that the availability of ready-made solutions might hinder the development of higher-order thinking. The ageing of teachers further aggravates the situation with the need to change the way of teaching at the end of their carrier. Another constraint is the generally low computer literacy of teachers. Furthermore, the higher ICT knowledge by many students put additional physiological barriers. How to overcome these barriers and how to integrate students to assist teachers in the learning process might be the key for success of the on-going reforms towards e-Learning also in CC13. Part of the solution might be a robust and user-friendly e-Learning environment – availability of relevant software, suitably designed educational portals, opportunity to access educational forums and to share views on curriculum development, good practice, etc.

Table 16: Use of computers by teachers and students

Activity	Teachers use (as % of all teachers)			Students use (as % of all students)		
	primary	private secondary	vocational	primary	private secondary	vocational
teaching	87	30	15	0	20	0
word processing	90	30	30	40	10	30
correspondence	40	10	15	40	10	30
chatting	0	0	0	10	10	30
downloading files	55	5	15	20	10	20
browsing	55	10	20	50	10	40
playing games	5	5	5	40	20	60
programming	10	0	5	30	10	40
administration	25	10	10	5	0	0

Source: OECD (2001c)

Some cases studied by OECD provide data on ICT use by teachers and students in Hungarian schools (see Table 16). The big difference in ICT usage in these schools is closely related to the working environment. Good management, a human approach to problems and high levels of organisation in a school are considered as the factors that bring successful ICT integration in education and lead to high motivation and innovativeness of the teachers (see Box 20).

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[115] Bicevskis et al. (2001)

Box 20: ICT education in primary schools – a best practice case

The primary school in Mako (a small town in South Hungary) has been considered as a flagship primary school for ICT in education for the whole county of Csongrad – one of the richest and most developed area in Hungary[116]There are 60 multimedia computers mainly housed in two laboratories – ICT and multimedia, however some computers are available in the staff room and in the library. The computer penetration and the staff involvement in this school are much higher than the average in Hungary – 5 computers per student (by 24.20 average), and about 50% of the staff members have completed an ICT course (5-10 out of 50 in average).

The most important achievement of the school is that teachers act as innovators, not merely adopters of ICT culture – the top 30% of them are eager to try designing and programming simple educational applications to suite better their needs. Teachers use ICTs as a tool for visualisation and simulation of experiments in science subjects, for preparing tests and task sheets for on-line examination or as a tool for navigation and searching information in history. They seldom use the available educational software and are very critical about its quality.

3.2 The necessary training of the workforce

Candidate countries are faced with enormous challenges in their attempt to catch up with the development of a knowledge-based economy while the process of transformation from a planned to an open market economy is still going on. This has immediate repercussions on the workforce[117]. Indeed, the competitiveness of companies appears increasingly dependent on the ability to develop, recruit and retain a technologically sophisticated workforce.

There are concerns that the labour force in the CC13 is not able to meet market demands for skilled workers and that this gap is growing. The assessment by foreign investors of the quality and deficiencies of the labour force in transition economies highlights the general lack of flexibility. As a result it is estimated that at least 6 months are needed to achieve the same level of productivity as in Western Europe[118].

At the same time, adult literacy data outline the growing disparities between generations (Figure 8), which might be further aggravated with ICTs growth.

The large disparities in employment between regions and among social groups in the CEEC10 also require attention[119]. In particular, the higher unemployment rates for young people (25 - 29 year olds) with a low level of education in Bulgaria, the Czech Republic, Estonia, Hungary, Lithuania and the Slovak Republic highlight the problems of this segment of the population to obtain an acceptable job[120]. At the same time, drop-out rates have increased in many CC13, and the participation rates of young people in secondary education are significantly lower than in the EU member states[121]. This might result in further negative consequences on the labour market with an increasing percentage of unemployed low-skilled workers.

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[116] http://waldorf.eds.udel.edu/oecd/report/cases/HU/Almasi/HU04.html; OECD, 2001c

[117] Shaw (1998) reports on a study of the European Training Foundation on the new skills required; see also Ducatel et. Al (1999) for a systematic overview of this problem.

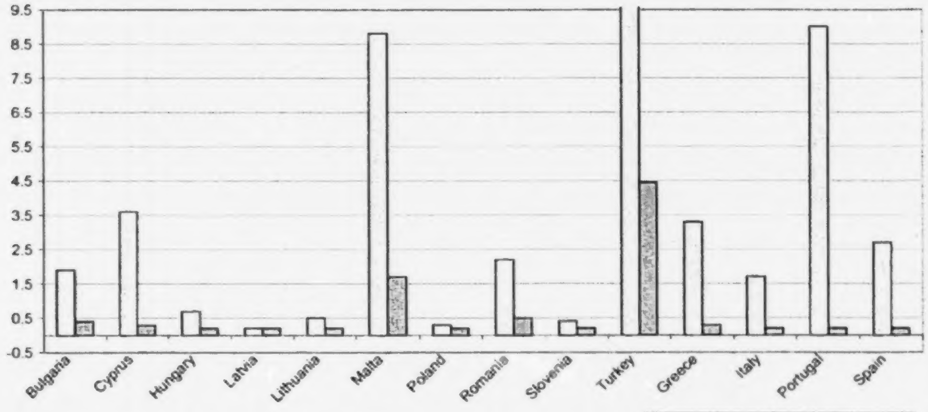
[118] EBRD (2000)

[119] Bogdanowicz et al. (2001), p. 22

[120] European Training Foundation (2000), p. 15

[121] Eurostat (2000c)

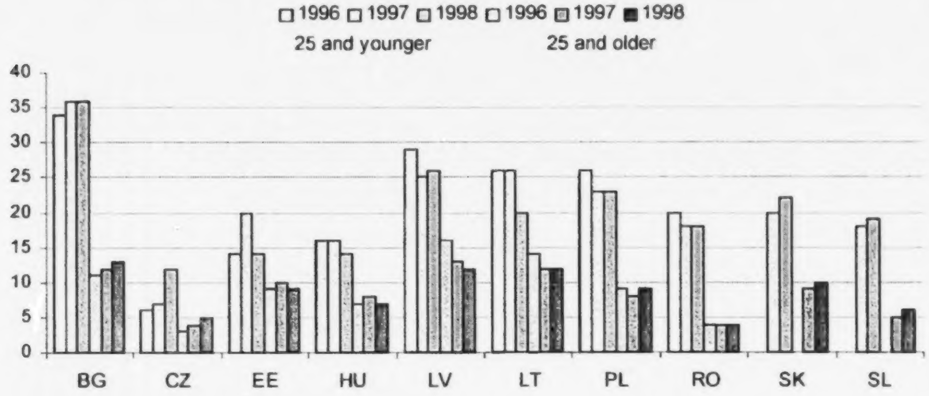
Figure 8: Estimated adult illiteracy rate (%)



Source: UNESCO, World education report 2000

Another important trend in CEEC10 is the high unemployment rate among young people, which is significantly higher than the average unemployment rate and/or the rate reported for elderly persons (see Figure 9). In Romania and Bulgaria it is as much as three times higher. Only in Estonia and the Czech Republic is the difference between the two rates less pronounced. Rates ranging between 20% and 25% are recorded for Lithuania, Poland and Slovakia. As a comparison, the relative scale of youth unemployment also varies markedly across the EU and is particularly high in Italy and Greece, where more than 30% of young people are unemployed.

Figure 9: Unemployment rate in CEEC10 by age groups



Source: European Training Foundation (2000)

It is obvious that the labour force in CC13 needs to respond to the changing demands. Along with the focus on preserving and educating new IT professionals, the main concerns in CC13 are to build a digitally-literate workforce, managers and leaders for the new economy.

Training and retraining of the workforce: ongoing developments

Adjusting or upgrading the existing skills base in the CC13 implies monitoring the labour market and developing methodologies to forecast medium-term skills' requirements. Due to the unstable economic situation and the large structural changes in the CEEC10 economies, these medium- to long-term planning activities are not well advanced[122].

Moreover, the transitional period and in particular the restructuring of the economy have seriously affected both vocational education and existing traditions of on-the-job-training by breaking-off existing links with enterprises and by cutting-down the support system for learning. While the on-going reforms in vocational schools are now targeted at building a new workforce to better meet the requirements of the changing environment, there is still a long way to go in the retraining of the present workforce, as well as keeping the employees on track with the changes of technology, economy and the society. On the other hand, the low level of continuing training for employed people is due to a large extent to the lack of stronger initiatives to encourage companies to invest in training.

Box 21: Continuous training activities in CC13

In *Hungary* in-company training is stimulated by the increased proportion of the employers' contribution to the Vocational Training Fund that companies might retain for developing their own employees. Some professional organisations and NGOs in *Estonia* have started initiatives focused primarily in areas where the demand and potential for economic gain are greatest (business, law, foreign languages, etc.), however, the costs of attending such programmes are often prohibitive.

In *Slovenia* initiatives to transform existing company-based training facilities into inter-company or regional practical training centres are gaining momentum. These centres would be used for the (practical parts of) training of both young people and adults in a specific region and/or sector. Centres are expected to be well equipped, thus reducing the pressure on the Ministries to invest in the modernisation of individual schools.

In *Malta* the private sector employers have made substantial financial investment for vocational education. Besides, the Employment and Training Corporation has increased the involvement and participation of employer organisations in apprenticeship schemes through the provision of on-the-job training and work placements during the apprenticeship.

Some schemes to encourage company-training activities of the Human Resource Development Authority (HRDA) in *Cyprus* have contributed to industry-based initial and continuous training of employees, vocational and university students. Through the support schemes applied have been strengthened companies human resource development systems, as well as fostered lifelong learning and the adaptability and employability of the employees. Nevertheless, the ETF considers that a need still exists in Cyprus for improvement in the innovative capacities of the vocational education and training system, including strategic policy making, research and development, and flexibility of vocational training institutions regarding the lifelong learning approach.

In *Turkey* also the lack of a structured, widespread and flexible system of continuing vocational training (particularly for the SMEs, 90 % of the companies) represents a clear obstacle to the application of the lifelong learning approach. Subsequently, significant improvements are required in order to mobilise and upgrade the skills of the active labour force to meet the fast changing needs of the labour market.

(European Training Foundation, 2000b; OECD, 2000; Procopides, 2001)

However, many initiatives are underway in all CC13 trying to respond to the increasing training needs of the labour force, and focused on building an open, flexible and transparent life-long learning system (see Box 21).

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[122] European Training Foundation (2000b)

Along with harmonisation of general education and vocational training with market demands, a special focus is needed on young people, and assistance in their early career path and their adaptation to the market requirements. This is the place for an active employment policy – to include preventive measures, taking account of regional problems and large-scale restructuring, and to provide better employment opportunities to low-skilled people improving their qualification.

Due to lack of finance, investments in active labour measures are quite limited in CEEC10. Some regional employment problems have been addressed in the framework of the Phare programme and regional training centres have been established in many countries (e.g. Bulgaria, Estonia, the Czech Republic, etc.). At the same time, as outlined in a recent UNDP report for Lithuania, growing competition is driving an increased interest in education and skills upgrading, which in turn has a positive effect on the quality and competitiveness of the labour force (see Box 22).

Box 22: Training for obtaining European Computer Driving Licence

In parallel to the activities for raising the general skills level of the workforce, training courses targeted at obtaining European Computer Driving Licence (ECDL) have been launched in many CC13, in most cases by domestic computer associations[123]. These activities are improving the knowledge and skills of citizens and employees related to basic IT concepts and file operations, word processing, work with spreadsheets and databases, as well as preparing presentations and communication skills.

In Hungary the ECDL courses and examinations have been integrated in the National Upgrading Programme for Public Officials, while in Estonia the retraining of the Statistical office employees was the objective of the collaboration of the statistical authorities with the Estonian IT Society. Lithuania and Latvia have enjoyed the support of the Swedish Information Processing Society in their efforts to introduce ECDL tests and solving the language problems. In Lithuania, in particular, ECDL has been considered as a tool for raising the overall computer literacy, while in Malta some ECDL centres certified by the British Computer Society have targeted the adults' computer skills offering evening courses.

The wide dissemination of ECDL courses and examinations in Europe is likely to develop it as an officially recognised European standard for IT literacy skills. However, the successful implementation of the ECDL is highly dependent on the recognition of the cultural, economical and political factors at national level.

Very popular places, providing not only Internet access, but also training opportunities for a wide audience, are the various community or telecentres, already mentioned in Chapter 1. They are responding to the users' demand for up-to-date IT training, assistance in acquiring ICT skills and ICT usage. Along with the different forms of training (self-learning or formal classes) the personal approach offered at a convenient local centre is attractive to many people and is warmly received by the population (see Box 23).

Finally, CC13 are also grabbing the opportunities that distance education offers them to meet training needs. Most candidate countries are developing 'virtual universities' to connect their existing educational institutions with the world ones, as well as to provide distance training for students. These distance-training courses are developed mainly through the financial support of international institutions, e.g. EU programmes, World Bank or UNDP initiatives, etc. For example, open-distance-learning structures in all

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[123] European Computer Driving Licence Foundation, http://www.ecdl.org, country links

CEEC10 have been introduced within the Phare Multi-country programme for distance education launched in 1993.[124]

Box 23: Community empowerment centres in Malta

Community Empowerment Centres (CEC) in Malta are initially used as learning centres, then skills acquiring centres and ultimately they can also be used as opportunity centres for teleworking and telebusiness initiatives.

The first CEC in Malta was set up in Fgura (Pop. 12.000) in 1996. In a period of about 15 months over 450 people underwent ICT awareness courses. The ages varied from 5 years to 76 years. Morning sessions have been offered for housewives, and a special programme for disabled people. Within short period of time, over 45 local councils (out of a total of 67 in Malta) have conducted ICT awareness courses, involving over 3300 people. A telephone survey conducted after the Fgura experience pointed out that 25% of the attendees have purchased a computer and 75% have continued to attend more specialised courses.

The overall objective of the course is to help people overcome their fear of technology. Further goals are to help people to understand that they also might use technology and to provide them some tools that they can use for learning, working, doing business or plain leisure. The very informal environment and the use of facilitators, not teachers or lecturers, might be considered as some of the factors for success. Besides, the promotion campaign, the wide support by the media and politicians, as well the financial contributions by companies and the local government have contributed to its wide attendance.

(Adapted from Milne, 2000)

ICT professionals

Despite the recent slow-down of the new economy and the cutting of many IT jobs in developed countries, the ICT sector in candidate countries is still in an 'uplink' trying to bridge the technological gaps, as discussed above in this report. On the availability of ICT professionals there are contradictory perspectives: Employee groups advocate there are enough high-skilled professionals, whilst IT associations often claim shortages of jobs. A recent assessment of the Cyprus Computer Society[125] pointed at a growing number of unfilled vacancies at all levels of the ICT hard core professionals (IT technicians and managers, programmers, systems analysts, network and systems support engineers, application developers, business software implementation consultants, graphics designers, etc). A critical assessment of the available human resources in Turkey, which traditionally has a good technical educational system, found skills shortage at the level of web designers and network-savvy employees, both critical for going into the e-commerce domain[126]. Shortages of IT engineers have also been estimated in Estonia for the period 2000-2002 of about 1200 people for the IT industry and 12000 IT specialists for other sectors. In Hungary shortages will reach 9500 by 2002[127]. Some CEEC10[128] (e.g. Latvia, Bulgaria, etc.), while also worrying about future shortages, consider the availability of high-qualified IT specialists as important strength for the IT sector growth. In particular, the expansion of software applications in many CEEC10 has been facilitated by the existing human capital accumulated previously in the sector[129].

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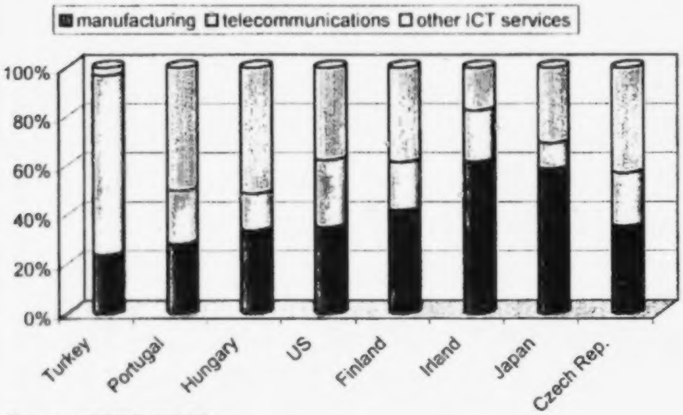
[124] European Training Foundation (1999)
[125] http://www.ccs.org.cy/JOBS/vacancies.htm
[126] Wolcott (1999), p.61
[127] European Commission, DG Enterprises (2001)
[128] Ernst&Young (1999), p.32; Centre for Economic Development (2001), p.69
[129] Kubielas et al. (2000)

The high growth in the telecommunications sector, the influx of governmental and foreign investments, resulting in relatively high salaries, have created attractive working conditions in the sector. Therefore many young people are choosing to study telecommunications and are entering the labour market. However, recent data[130] show that employment in transport and communication in the CC13 is at, or above, EU levels. It is expected that the future digitisation of networks and introduction of new services might leave a number of previous workers, who are not flexible enough in the changing environment, out of work. The excess of personnel in incumbent operators is a major challenge to their transformation, as well as the lack of adequate management skills.

In general, it is difficult to assess the real situation on the labour market in the ICT sector for all CC13. Employment data by branches are available either for the industry and services sectors in general or for some categories of services, e.g. financial, transport and communication, etc. Similar to the EU patterns, services constitute the largest economic sector in most CC13 – with employment shares reaching 70.5% in Cyprus, 66.6% in Malta, and in the range of 50-60% in most CEEC10. The services share in employment is lower Only in Turkey and Romania – respectively 41.3% and 29%.[131]

Figure 10: ICT Employment distribution by industrial sector



Source: OECD (1998)

OECD data point out large differences in employment in the ICT sector as a share of the business sector in some CC13 – Hungary takes the 3rd place among OECD countries, while Turkey and the Czech Republic are below OECD-average. Besides, the telecommunication industry makes up over 70% of the ICT sector employment in Turkey, while in the Czech Republic and Hungary the ICT manufacturing and services dominate (Figure 10). However, regarding innovativeness of the ICT sector and the value added to employment ratio, these countries are lagging far behind other OECD members[132].

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[130] European Commission (2001)
[131] Bogdanowicz et al. (2001), p. 14
[132] OECD (1998)

Data of the National Statistical Office of Bulgaria[133] provide some insight into the distribution of employees in the ICT sector. 53.6% of employees in computer-related services are employed in small enterprises (less than 10 employees), and only 13.9% in big enterprises (over 100 employees). The reverse picture is present in the post and telecommunications services, the industry for office machinery and computers, radio, television and communication equipment and apparatus – with 93.1%, 77.7% and 73.3% employed respectively in the big enterprises.

Some candidate countries (e.g.Bulgaria, Estonia) are worried about the brain-drain of IT professionals. The IT companies' policy in the developed countries to employ experienced IT specialists is exacerbating the situation in other countries, attracting their best-trained specialists. There are also many fears that recent changes in the migration policy of some developed countries might facilitate the mobility of high-skilled specialists and thus increase the brain-drain. According to OECD[134] estimates, around 50% of all Turkish post-graduate students in the US are potential emigrants. A World Economic Forum survey [135] states that talented people would rather remain in Poland and the Czech Republic, whereas the probability of a brain-drain is much higher in Bulgaria and Slovakia. Although the national statistics provide no exact data, the Bulgarian Association of Information Technologies[136] (BAIT) claims that more than 15000 IT specialists have left the country in the last 10 years. Emigration is especially high among young people due, to a great extent, to the economic situation and the insufficient career prospects in the country. In Latvia[137], there are some hopes that talented people presently working abroad will return. On the other hand, as Ernst&Young observed in its study, the best IT specialists are unlikely to leave the country due to the high living standards they enjoy there.

The internal brain-drain also needs attention[138]. In particular foreign-owned companies and banks provide better employment conditions for highly-skilled engineers, programmers and system administrators and have attracted the best-trained specialists, often leading to a lack of skilled personnel in local companies and research units. In Estonia, for example, the Tallinn Technical University has lost dozens of highly educated employees due to the banks[139]. The private electronic media are similarly attracting the most talented journalists and producers with higher wages and career opportunities. Thus, public broadcasters, with insufficient financial and technical means, may experience problems in employing appropriate staff.

There are also more general threats based on the trends in higher education and research. On the one hand, the high growth in the ICT sector and the relatively high salaries there are attracting many students to study communications or computers. Compared to some OECD countries, tertiary level graduates in computing (as a percentage of all fields of study) in Slovakia (5.1%) and the Czech Republic (2.8%) are higher than in the US (2.6%) and Finland (2.4%), while in Turkey (1.9%) and in Hungary (1.2%) they are higher than in Italy (1.1%)[140]. In Latvia, for example, there is a big interest of secondary school graduates to study computer sciences, however only half of the applicants are admitted. On the other hand, after obtaining their Masters' degrees young people are no longer interested in post-graduate education or research careers in most CEEC10.[141] Therefore, professors have worried in Latvia[142] that the present achievements in the higher education in ICT are based on the scientific potential of the past and young people are not choosing an university career, thus putting into question the longer-term prospective for the training of ICT professionals.

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[133] quoted by Centre for economic development (2001), p.134
[134] OECD (2001d), p. 44
[135] quoted by Centre for economic development, p.110
[136] referred to by Vitosha Research (2001)
[137] Tukisa (1999), Ernst&Young (1999)
[138] Romijn (1998)
[139] Kalja (1999)

The problems that the educational system in the CC13 presently face, the skills mismatch of the workers and the very fast outdating of competencies often motivate larger companies to elaborate their own individual programmes in order to retrain their employees. In Bulgaria Cisco has its own academy, in the Baltic states Microsoft runs authorised training programs, IBM computer class are part of the University of Latvia, etc.[143] This tendency to private certification is particularly important for the enterprises involved in ICT development and maintenance, as well as the major users and providers of knowledge-intensive services. Specialised training and re-training courses are offered for bank and telecommunications employees, computer specialists, etc.

Preparing the present managers and leaders for tomorrows economy

The diversity of models and development paths, that we presently observe in candidate countries at national, regional and organisational/company levels, is to a large extent based on their ability to take proper decisions, assess present trends and future scenarios and use at best possible way available resources, traditions, geographical location, etc. Individual entrepreneurship and knowledge compensates in many cases the lack of proper policy framework and awareness, and drives bottom-up activities in all CC13.

While the Mediterranean countries have market economies with longer experience, the transition decade has faced CEEC10 with the challenge to prepare managers able to raise the competitiveness of their companies and adapt them to the rapidly changing technological and market conditions. Although there are some indications that individual enterpreneurship is driving the up-take of many economic activities in candidate countries, in particular in services sector, the lack of entrepreneurship and aversion to risk are claimed to be weaknesses of businesses in the CEEC10[144]. As EBRD pointed out in the 2000 Transition report, foreign investors have experienced more difficulties in finding good managers than IT or financial staff.

The training needs of managers in some CEEC10 have been assessed in a cross-country survey sponsored by the European Training Foundation[145]. It is interesting to note one of the observations made – that a great majority of managers still see themselves primarily as functional specialists and professionals. Though most of them have a growing awareness of the challenges of the new environment, a certain degree of reluctance and aversion to radical changes, in particular in hierarchy, has been also observed. Strategic thinking seems to be underdeveloped and strategy is misinterpreted or even confused with tactics, tools and instruments. A noticeable shift in the strategic focus has been outlined from the previously emphasis on 'hard' elements (organisational structure, systems, procedures, etc.) towards emphasis on 'soft' elements like skills, staff, style and values. While middle and lower level management generally need more training to improve their capabilities, considerable managerial and leadership potential has been recognised within the non-managerial groups of young talents and professionals, though this is still under-utilised (see Figure 11).

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[140] OECD (2001d), p. 22

[141] for details Gourova et al. (2001b);

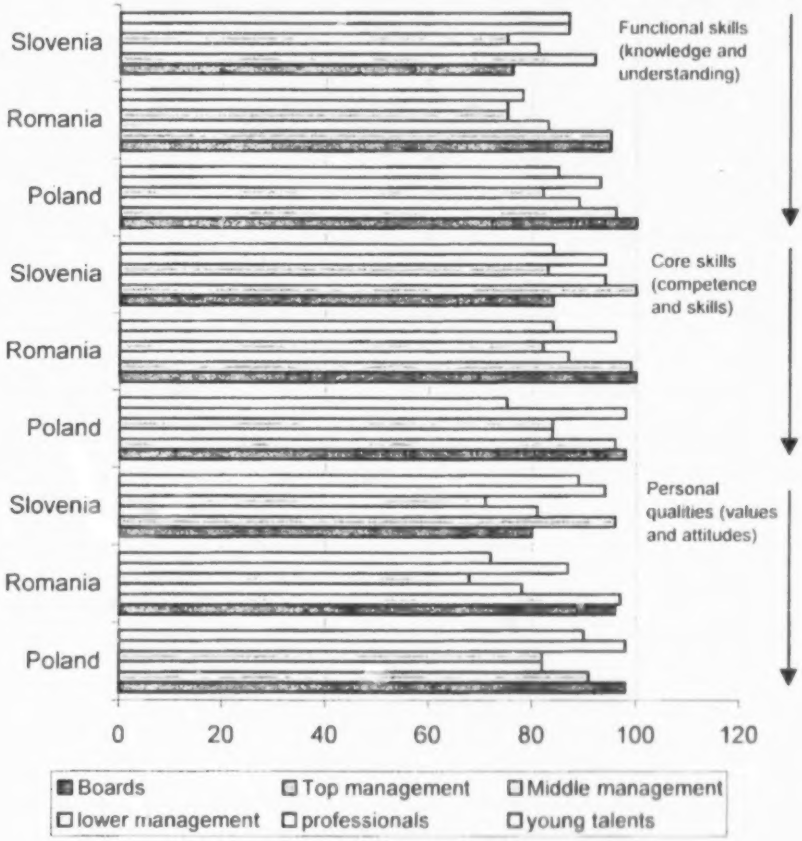
[142] Tukisa (1999)

[143] Gourova et al. (2001b), Ernst and Young (1999), http://www.microsoft.com/train_cert/

[144] EBRD (2000)

[145] Gudic, M. (2000)

Figure 11: Current management capabilities



Source: adapted from Gudic (2000), ETF

Applying innovation management techniques (IMT) in company management is considered as a serious need in CC13. IMT methods, like value analysis, business process reengineering, project development and management, benchmarking of competitive capacity of companies, technology watch, quality management techniques, etc., available for firms in the EU, also need to be introduced in the company praxis in CC13. This would help them to develop more forward-looking attitudes, as well as to focus on human resources, technology and markets[146]. In particular, SMEs lack the resources or know-how to think in strategic terms, and their use of advanced technologies is relatively low. Therefore, within the EU negotiation process, special attention is devoted to support the development of SMEs. Many actions, already underway, focus on:

- ensuring that the SME's are connected to the global networks via regional information centres;
- creating conditions for the development of highly effective SMEs based on own resources and intellectual property;
- setting up of regional training centres to support staff and managers of SME's.

Over the last few years management training in CC13 has gained momentum. It focuses on all management levels and is addressed by companies, educational institutions, professional organisations or NGOs. Seminars and short courses prevail in the training process. For example, special courses related both to technical and organisational aspects of innovation, including management and transfer of technology, specific methods of analysis, intellectual property and entrepreneurship are provided at the Czech Technical University in Prague. Additional courses on management of change, quality management, business administration, etc. are organised to complement the traditional degree programmes or build part of special programmes developed jointly by universities and companies according to the management needs. International collaboration and networking are other important action lines providing local companies opportunities to benefit from external experience and to develop the necessary managerial capabilities.[147]

Turning to the public sector, the EU regular reports highlight the need for strengthening the administrative capacity of CC13. Along with the organisational and structural changes in administration, the capabilities of human resources to respond adequately to the political, social, technological and market changes need careful consideration. The governance of the science and technology, the implementation of an active labour policy and the establishment of a vision for the future of the country all require the building of strategic thinking by leaders and decision makers in CC13. More generally this would strengthen their capacity to apply up-to-date policy-making tools in the governance process.

After the start of the comprehensive reforms in the telecommunications sector, many initiatives have been carried out in all CEEC10 to strengthen administrative capacity and prepare the policy and regulatory bodies for full competition on the market. However, other administrative bodies have been not able to undergo such training in technologies. In particular, the introduction of ICT in the public sector, the focus on e-Learning, e-Government, intelligent transport, etc. raises the issue of strengthening general and special ICT competencies in all public institutions. At the same time it calls for increasing decision makers' awareness of the opportunities provided by new communication tools for companies, individuals and the society as a whole in order to be able to take appropriate decisions to facilitate the ICT development.

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[146] European Commission, DG Enterprises (2001)
[147] European Training Foundation (2000b)

3.3 Challenges

Responding to the needs of rapidly changing technological development as well as to the shift towards a knowledge-based economy, require as much the right skills and capabilities as it requires the best possible info-structure or infrastructure.

Addressing the missing skills and capabilities however is in the first place a question of setting the right institutional and cultural priorities and involves a cross-sectoral and long-term policy approach.

Creating and strengthening an adequate e-Learning environment

Bridging the knowledge divide: Present e-Learning trends in candidate countries are widening the gap between peripherals and capitals, low and high-income people, young and old. The growing polarisation based on the different opportunities to access high quality education and computer classes endangers the establishment of a cohesive society and might have negative consequences for the whole democratic process. Therefore, it is a big challenge for CC13 to use the opportunities offered by ICTs to overcome the geographical barriers and to facilitate access to education and knowledge in disadvantaged regions. At the same time, public policy needs to change its focus towards more balanced development in education so that young and old people are not left behind. As lifelong learning is also a challenge to address here, there is a need for careful estimation of the costs for society if investments in education are delayed, thus widening the knowledge gap.

Higher effectiveness of ICT use: The use of computers in education depends on the pedagogical competence and ICT skills of teachers and their ability to absorb innovative approaches in the learning process. This requires a change of focus for teacher training from obtaining basic ICT skills towards guidance on how to use ICTs more effectively. The availability of high-quality educational multimedia tools, and a robust, friendly e-Learning environment might be the necessary factors to motivate teachers to make the required professional and personal effort. However, careful assistance is needed in the process of forming the new role of the teachers as facilitators, as well assessment of the real demands of teachers and pupils.

Building partnerships: Regardless of the approach taken towards e-Learning, partnerships along the whole communication process are needed. Working together at the level of content, technology, services and schools will allow every actor to conform with and complement the activities of the others. At the same time the role of the educational institutions need to be strengthened, taking into account that bottom-up initiatives of the school management have often compensated for the lack of public resources and sufficient awareness of educational authorities.

The need for an encompassing employment policy focused on the skills needed in the knowledge-based society

Managers and leaders for the knowledge economy: The digital literacy of managers and their awareness of ICT opportunities could increase the competitiveness of firms and contribute to their growth. Willingness to encourage entrepreneurial attitudes, starting in schools and continuing through life-long learning, should be high on national political agendas. It is important to create and promote a national corporate culture that embraces the lifelong learning concept. At the same time, the knowledge-based society places increasing importance on analytical and conceptual skills and the development of global and prospective visions. Candidate countries have a long way to go to strengthen leadership and make use of new strategy and planning tools.

Focusing on skills gaps: Though candidate countries have a high-skilled labour force, skills mismatches with regard to the needs of a knowledge-based economy are emerging. In reality, CC13 face the same labour problems as the other developed countries, caused by the structural shifts on the market and the rapidly changing technologies. The high demand for highly skilled workers further aggravates the situation and requires careful assessment of how to keep IT specialists and researchers or encourage them to return. There is also a need here to focus on building the new specialists and improving the skills of present workers. The latter form the largest part of the population and are the ones who are running businesses now. Development has to go through them and therefore their continuous training is of utmost importance for the creation of a more productive society as a whole. Low-skilled workers require particular attention in order not to be excluded or lose their jobs.

ICTs for employment: Along with the overall changes on the labour market in CC13 there is a need to grasp the opportunities offered by ICTs for flexible working conditions. Telework or distance working might be explored to solve the growing regional problems of unemployment, as well as to provide opportunities for young women to preserve their jobs while taking care of small children. Besides, the outsourcing of services and telework by IT employees and scientists might be a successful weapon against brain-drain. However, a big challenge for national and regional authorities is to provide an appropriate framework for the development of telework and its recognition as an alternative to fixed employment, offering the same social protection and favourable tax relief.

Learning and working in a rapidly changing environment

Strengthening collaboration: Time pressure and increased competition on regional, national and global markets is driving companies to focus earlier on the skills and knowledge of their future employees and customers, thus investing in education and collaborating with general, vocational schools or universities. The growing problems of youth unemployment and long-term unemployment in most CC13 calls for increasing collaboration between labour and educational authorities in order to take preventive measures against skills mismatches, as well to increase employability and meet present and future market demands for high-skilled employees. Along with the deployment of modern policy-making tools, there is a need to strengthen the links between all actors for strategy planning and implementation.

ICT literate citizens: Beyond the requirements for specialised knowledge and skills, the CC13 need educated citizens able to use the computer networks and interested in new services and tools. It is vital for the future development of candidate countries that everyone is provided with the opportunity to obtain the knowledge and skills needed to use basic IS services – regardless of age, disability, income or gender.

Chapter 4
Conclusions and outlook

The issues described in the previous 3 chapters represent a first attempt to outline the development of ICTs in the CC13 as well as the resulting challenges and opportunities with regard to their future overall development and that of their ICT sector specifically.

Competitiveness of the ICT Industry

Trends in the markets of telecommunication services and equipment, IT services and hardware, as well as provision of content, show the ability of the domestic industry to find market niches where it gains competitive advantages using its local knowledge of customers. The applied software and services sectors are dominated by domestic enterprises. It is most likely that future growth in the ICT industry in the CC13 will take advantage of the cultural and linguistic differences and particularities as well as the increasing demand of the population and enterprises for local content and tailor-made or home-adapted knowledge-intensive services.

The telecommunications industry and electronic media are still dominated by domestic enterprises. However, changes in incumbent ownership and the interests of foreign companies will most likely change this picture soon and in an irreversible way. Consolidation of domestic companies in a more multinational setting will be important for their ability to compete with powerful foreign market entrants. However, in this competition, local enterprises often lose their skilled human resources, and are confronted with the obstacle of their relatively limited financial resources.. The demands on the regulatory and competition authorities to strike a balance between opening up the market and consolidating the domestic industry will only increase and raise serious policy problems in particular with regard to applying the acquis communautaire in this area.

Although the CC13 are not able to compete with major foreign manufacturers and leading ICT companies, they might attract them with the possibility of market expansion. The most successful candidate countries were able to engage foreign companies in investment in domestic manufacturing and technology transfer. The public procurement policy and investment climate could be used as important tools for further development of local branches of the ICT industry. Internet infrastructure is highly dependent on the investment capabilities of the industry. Therefore lack of foreign direct investment is likely to slow the pace of Internet growth in candidate countries[148]. However, it remains to be seen if the current gloom in the technology sector will delay the immediate process of change and in particular threaten FDI in the sector as technology stocks lose their credit ratings. Looking to 2010, the on-going process of concentration in the sector is therefore likely to continue, though it is unclear how this will affect the competitiveness of the CC13 as such. Their underlying competitiveness in a single European market with full labour mobility depends on the overall international competitiveness of an enlarged EU.

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[148] The potential contribution in the ICT field of international finance institutions such as the EBRD and the International Finance Corporation (IFC) has not been addressed in this report.

The wider impact of ICT on the domestic economy

The rapid growth of ICTs present local industry in the CC13 with the need to introduce advanced technologies in marketing, management practice, working organisation and customers relations. The need for higher efficiency and competitiveness is driving companies to develop new functions, new business models and attitudes. Despite the slow absorption of new ICT-based solutions, particularly by SMEs, the introduction of e-business models in large enterprises and multinationals is pushing local enterprises to go on-line. Easier connection to banks and public authorities could also improve the attitude of companies to ICTs.

However, the lack of enterpreneurship and vision by managers, as well as the insufficient skills of the employees, could hamper the adoption of new technological solutions and hence the transformation towards a more geared up economy and public sector. The lack of a secure or trustworthy digital environment is also holding back the development of e-commerce and e-business. The slowness of development of new payment solutions and use of new technology by the population might also explain the tendency of a number of enterprises to wait.

Positive effects on the economy can be expected from the introduction of ICTs in central government, tax administration and customs. New technologies can contribute to the transparency of governmental decisions and public procurement, as well as facilitating the dialogue with citizens and enterprises on important decisions and legislative measures. ICTs could also be a serious weapon against corruption and the grey economy, thus contributing to an increased financial flow to the budget and to the social system.

ICT impact on democracy by 2010

The young democracies in the CC13 are faced, like all EU countries, with the negative implications of new technologies, related to the transformation of the media sector, the infringement of intellectual property rights and human rights. The protection of human dignity, children, property rights, etc. in the new digital environment requires the collaboration of all stakeholders in order to implement the best possible solutions to prevent control of private behaviour and information, dissemination of damaging content, and provide all individuals with access to high-quality content.

However a healthy media sector also clearly contributes to the democratic process.

Public authorities, NGOs and the ICT industry also have an important role to play in providing disadvantaged groups (older people, people with disabilities or those who live in remote areas) with the necessary tools to access and use new services and high quality content, and to facilitate their participation in public life.

As it is the main objective of e-governance to put people on line instead of offline and, by doing so, bring power closer to the people, it is clear that e-governance can contribute significantly to the functioning of democratic processes, and to the promotion of social inclusion and cohesion in the CC13.

ICT related employment and skills issues

As in most European countries, ICTs in the CC13 create opportunities for employment growth in the services sector, as well as generating new jobs and shifts to alternative jobs. The changes in organisation and structure of work and business activities require a new enterprise culture, new skills and knowledge in the workforce. People are the most valuable resource in the knowledge-based economy. However, are the CC13 ready to respond to the growing demands on the labour force and managers and the new employment requirements?

The changes in the educational system, the initiatives of enterprises and NGOs, are attempts to address the increasing demands for highly qualified specialists to develop technologies and services, as well as for qualified workers and citizens to use ICTs in their everyday lives and work. Changing teachers' behaviour and attitudes to the learning process could be a challenge. Furthermore, the lack of teachers and finance for education and training is likely to be reflected in a corresponding lack of higher skills within the population with all the negative consequences for the economy, democracy and social cohesion. Governments must take proactive measures to ensure the quality of education, and subsequently the future workforce and citizens, in order to avoid further splitting the society into info-rich and info-poor and to ensure future economic growth based on advanced technologies and high-skilled labour.

The development of an educated, skilled labour force has to be carefully balanced across all sectors of the economy and society. A potential paradox of unbalanced education in ICT development is that most probably the sector specific skills shortage will be solved, while high levels of ICT illiteracy will remain throughout the other sectors of the economy and society at large. Such a paradox is counterproductive when considering the necessity of a well-developed demand side and the social dimension of the Information Society. It is therefore important to include not only the young population and ICT sector workers – the most obvious targets – in the training programs, but to devise a strategy that also focuses on the older population on the one hand, and the vocational training of the employees in all other sectors of the labour market on the other hand. An encompassing active labour market policy is needed to respond to the structural changes caused by the ICT diffusion in the economy, as well as to combat the growing unemployment, and in particular the long-term unemployment of the low-skilled.

In addition, an emphasis on the development of a strong innovation culture is generally seen as an important backbone for a healthy economy, which can attract FDI and enhance competitiveness. The foundation for this structure needs to be built within the educational system and extended throughout academia.

Addressing the missing skills and capabilities however is in the first place a question of setting the right institutional and cultural priorities and involves a cross-sectoral and long-term policy approach. Creating the right mindset is therefore as important as laying out broadband.

The complex nature of the digital divide in the CC13

Access to advanced technologies and networks and the ability to use them enables individuals, groups of people, and regions to gain the benefits of the networking revolution and to participate in the new economy and society. Despite the growing use of ICTs in the CC13, there are serious risks that ICTs will further widen the gap between rich and poor, and young and old and endanger social cohesion and democratic participation. This is especially acute in rural areas. The CC13 are faced with the challenge of using ICTs as a tool for regional development and breaking the barriers of distance of remote and sparsely populated areas in order to avoid social isolation and foster cohesion.

The digital divide in the CC13 is more complex than in EU member states. Besides the traditional urban/rural divide and the gaps between rich and poor and the generations, there is also a divide between small and large cities and between enterprises. The development of new technologies varies considerably between the candidate countries themselves – some reaching the EU average level and others lagging far behind the less advanced member states. As in the rest of Europe, the different pace of economic growth and the policy of national governments in the ICT sector have introduced large differences in telecommunication penetration and the availability of advanced services to the general public and businesses. It is likely that, due to limited financial resources, the CC13 need to prioritise what aspects of the digital divide they want to address first with a view to generating maximum impact. In that respect the question also arises as to whether the conditions of the EU universal service policy could be problematic in candidate countries. It should be stressed that the challenges and opportunities described above have to be seen against the background of the overall challenges for the development of the CC13 from an EU/CC13 co-operative point of view. It is both in the EU's and in the CC13s' interests to join forces in this field as well

The CC13 indeed face enormous problems in their transition to modern economies and societies. Their policy makers will be under huge pressure to respond to the legitimate short term needs and problems of their population rather than the more long term problems of the roll out of an IS.

Striking a balance between these two sets of policy objectives (acute societal day-to-day needs and IS needs) is probably the most difficult policy challenge in that respect.

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Annex II:
List of Acronyms and Abbreviations

AAA	Authentication, Authorisation and Accounting
ATM	Asynchronous Transfer Mode
ADSL	Asymmetric Digital Subscriber Line
BAIT	Bulgarian Association of Information Technologies
BG	Bulgaria
BSFOCS	Black Sea Fibre Optics Cable System
B2B	Business-to-Business
B2C	Business-to-Consumers
BTC	Bulgarian Telecommunications Company
CC13	The 13 countries Candidate Countries in process of joining the European Union: Bulgaria, the Czech Republic, Cyprus, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Turkey
CD-ROM	Compact Disc Read Only Memory
CEC	Community Empowerment Centres
CEE	Central and Eastern European (countries)
CEEC10	The 10 Central and Eastern European Countries in process of joining the European Union
CEEBIC	Central and Eastern Europe Business Information Centre
CPS	Certification Practice Statement
CY	Cyprus
CZ	Czech Republic
DE	Germany
DSL	Digital Subscriber Line (xDSL includes various types of DSL)
EBRD	European Bank for Reconstruction and Development
ECG	Electrocardiograph
ECDL	European Computer Driving License
EDI	Electronic Data Interchange
EE	Estonia
EITO	European Information Technology Observatory
ESIS	European Survey of the Information Society
ETF	European Training Foundation
EU	European Union
EU15	The present 15 member states of the European Union
EU28	European Union of 28 member states – EU15 and CC13
EUTELSAT	European Telecommunications Satellite Organisation
FDI	Foreign direct investment
FIN	Finland
FLAG	Fibre Link Around the Globe
GDP	Gross Domestic Product
GIS	Geographic information systems
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
GPRS	General Packet Radio Service
GR	Greece
GSM	Global System for Mobile communications
G2B	Government-to-Business
G2C	Government-to-Citizens
HDSL	High-bit-rate Digital Subscriber Line
HRDA	Human Resource Development Authority
HU	Hungary
HSCSD	High Speed Circuit Switched Data
ICT	Information and Communication Technology
IFC	International Finance Corporation
IMT	Innovation Management Technique

Inmarsat	International Mobile Satellite Organisation
IP	Internet Protocol
IPR	Intellectual Property Right
IPTS	Institute for Prospective Technological Studies
IS	Information Society
ISP	Internet Service Provider
ISDN	Integrated Services Digital Network
ISPO	Information Society Promotion Office
IT	Information Technology
ITU	International Telecommunications Union
JSC	Joint Stock Company
KBN	State Committee for Scientific Research – Poland (Komitet Badan Naukowych)
LAN	Local Area Network
LIIS	Latvian Education Informatisation System
LV	Latvia
LT	Lithuania
NGO	Non-Governmental Organisation
MT	Malta
MS	Member State
OECD	Organisation for Economic Co-operation and Development
OH&S	Occupational Health and Safety
PC	Personal Computer
PKI	Public Key Infrastructure
PL	Poland
PSTN	Public Switched Telecommunications Network
RO	Romania
RU	Russia
SDH	Synchronous Digital Hierarchy
SK	Slovakia
SL	Slovenia
SME	Small and Medium-sized Enterprise
SPI	Software Process Improvement
TBL	Trans-Balkan Line
TEL	Trans-European Line
TEN	Trans-European Network
TRIPS	Trade-related aspects of Intellectual Property Rights
TU	Turkey
TV	Television
UN	United Nations
UNDP	United Nations Development Program
UNESCO	United Nations Educational, Scientific and Cultural Organisation
US	United States
USSR	Union of the Soviet Socialists Republics
VSAT	Very Small Aperture Terminal
VDSL	Very high-bit-rate Digital Subscriber Line
WAP	Wireless Application Protocol
WAN	Wide-Area Network
WIIW	Vienna Institute for International Economic Studies
xDSL	various types of Digital Subscriber Line (ADSL, HDSL, VDSL, etc.)

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